COAL AGE

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Dust and its Allayment

Research has proved that every space in the universe is pervaded with dust of some sort. Cosmical dust is known to be continually falling upon the earth. A rift in the clouds shows a bar of sunshine and dust or vapor. A hole in the shutter admits a peep of sunshine and reveals a streak of dust. The atmosphere of machine shops where quantities of cast iron are being turned is pervaded with iron dust which sparkles in the gaslight, but is not otherwise visible. The dust of flour mills is also invisible or unnoticeable, but it is there all the same, and explodes under certain conditions.

The atmosphere of coal mines is notoriously addicted to dust, and to explosions attributable thereto. All explosions in mines are not traceable to coal dust; some are caused by gas, or by gas and dust combined.

The circulation of air necessary for proper ventilation compels also a circulation of dust which may accumulate in spots to such density as to become explosive. The admixture of gas may determine the explosive point. Anyway explosions occur, and it is not always known which is the detonating medium.

Increased ventilation would seem to be the rational remedy. But on the other hand increased currents of air stir up and circulate the dust in greater quantity. Spraying is recommended and practiced in some mines, but when plain water is used it soon dries and the dust becomes as bad as ever.

At the risk of "butting in," I would recommend a spray composed of fire clay dissolved in water to a consistency of milk, and applied by a barrel sprayer on a truck or coal car, which can be moved around wherever tracks are laid. Such a mixture would seal the dust to the walls, or precipitate it to the floor; and incidentally the spraying operation would pick up and concentrate much of the floating dust. If this were thoroughly done and kept well up to the workings the danger from dust would be lessened, and the ventilation would do the rest —perhaps.

It would be expensive to whitewash the whole interior of a mine; but so is an explosion, and of the two evils the lesser should be chosen.

Straight Line Ventilation

The experienced mine foreman, or superintendent, is probably the highest authority on the distribution of air in mines. Every miner and operator knows how disagreeable it is to work in a swiftly moving current of air. Therefore, the flow of air at the working faces should be as moderate as is commensurate with safety and health. But in a practical consideration the air must be forced with sufficient velocity and tension to carry it to the furthermost working point. Consequently the main lines of ventilation should be straight and direct, and the distribution conducted at right angles from the main, or possibly in a reverse direction.

In such a condition as this it would require less power to circulate a given quantity of air than in mines where the air courses run zigzag at numerous angles regardless of proper distribution. It is well known that a few right-angle turns knock the life out of a current of air, unless it has a powerful force behind it, hence the advantage in straight lines. The same rule applies to water in pipe lines.

It is frequently noted that some fans do not deliver half the amount of air for which they are rated. Others of identical construction, under favorable conditions deliver their rated capacity.

The roughness or unevenness of the walls mean much, but the main cause of the difference in fan deliveries is the indirect air courses.

The present fashion in higher speed fans is given the credit (to which they are entitled), for improved ventilation, but no credit is accorded the present better distribution of air. Mines are better planned and arranged now than formerly, and hence the ventilation improves year by year.

It is well known that all fans are not equally efficient. One of the most lauded ones at the last Paris Exposition would not blow a man's hat off, when in the direct current and with the fan at full speed. Yet this same fan has been copied in this country.

Actions speak louder than printer's ink, but printer's ink in some cases is the lubricant most used. It is not always the best, however.

By C. W. CRAWFORD

Uses for Underground Fans

By Henry Briggs*

SYNOPSIS—Underground fans may be used for main ventilation, for boosting or merely for cooling purposes. When used as the mainstays in ventilation, they permit the outside standby fan to be protected by doors and so increase safety. However, if they are electrically driven they introduce the dangers inherent in the use of that power.

Underground fans are already a familiar feature of British mining. They are being used, (1) as main ventilators, responsible for the whole ventilating current; (2) as auxiliary ventilators, otherwise known as "booster" fans, assisting the work of the surface fan in ventilating certain sections of a mine; and (3) as "closed-circuit" ventilators, whose purpose is to create a more rapid flow of air in specially hot parts of a mine.

In this last application the underground fan, which is usually small, does not add to the volume of air passing through the mine; it merely induces a closed circulation of air within the workings. The quicker local flow is, however, beneficial to workers in hot places.

Underground Fans as Main Ventilators

Not many mines go so far as to use underground fans as main ventilators. When they are so applied, a surface fan must be installed of a capacity sufficient to ventilate the whole mine in case of a disaster to the underground machines. The standby fan at the surface must also be arranged to allow of the air being reversed, provision for such reversal being compulsory in British collieries. Rare though it be, the utilization of underground fans as main ventilators has much in its favor, especially where several seams are being worked from the same pair of shafts.

Instead of adjusting the flow into the various seams by artificially impeding the current in the shorter and more greedy sections by means of regulators—the only method possible when one fan at the surface serves them all—regulation in the newer method can be provided by the adjustment of the speeds of the fans in the different seams or districts. The result is that to circulate given quantities of air in each of the sections less power is absorbed by several fans working in parallel than by a single surface fan.

The provision of a standby fan at the surface removes much of the weight of the objection that underground fans may be destroyed by an explosion. The question is, however, one worth examining a little further. When the regular ventilation of a mine is entirely produced by fans below ground, both the shaft mouths are normally open, and the standby is completely shut off from the mine by one or more steel doors.

If a large explosion were to take place, we must assume, to be on the right side, that every fan underground would become unworkable; yet the open shaft mouth and the protection of the steel doors render it less likely that the surface fan would be damaged than if it were in operation as the main ventilator. Hence it is permissible to conclude that the reëstablishment of the air current after an explosion would actually be easier when underground fans generate the entire normal air current.

Booster Fans to Assist Main Ventilator

The chief use of the underground fan at present is, however, as a booster, running "in series" with the main ventilator at the surface and assisting the latter in airing some section which requires an abnormal air supply or possesses abnormal resistance.

Disappointment has sometimes been expressed at the performance of an underground fan working in series with one at the surface, owing to the comparatively small increase in air volume resulting from that combination. The late Walton Brown was, I believe, the first to show that such a result was strictly in accord with theory. His analysis of the problem will bear repetition:

Let Q_1 and h_1 be respectively the yield in cubic feet per minute and the water gage generated by the main

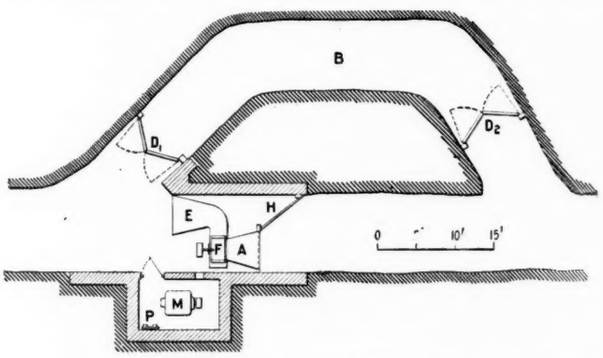

FIG. 1. ARRANGEMENT OF SIROCCO FAN AND MOTOR

fan when running alone; and Q_2 and h_2 the equivalent yield and water gage for the underground fan also when working alone. Also let Q and h represent the yield and gage when the two fans work together and in series.

The useful work done in moving air when the main fan runs alone is $5.2\ h_1 Q_1$ ft.-lb. per min., and when the underground fan works alone, $5.2\ h_2 Q_2$ ft.-lb. per min.

When the two operate together, the total useful work done will be $5.2\ (h_1 Q_1 + h_2 Q_2)$, and this, otherwise expressed, is $5.2\ h\ Q$.

Therefore

$$h\ Q = h_1 Q_1 + h_2 Q_2 \qquad (1)$$

But as the air circuit remains very nearly unchanged in character, whether the main fan of the auxiliary work alone or the two run together, the water gage is, by Atkinson's rule, proportional to the square of the volume of air, or

$$\frac{h}{Q^2} = \frac{h_1}{Q_1^2} = \frac{h_2}{Q_2^2} = a\ constant \qquad (2)$$

Now equation (1) may be rewritten

$$\frac{h Q^3}{Q^2} = \frac{h_1 Q_1^3}{Q_1^2} + \frac{h_2 Q_2^3}{Q_2^2}$$

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and dividing through by the constant of equation (2) we obtain

$$Q^3 = Q^3_1 + Q^3_2 \qquad (3)$$

In practice the surface fan is the more powerful; that is, Q_1 is greater than Q_2. Even if the fans were to be made of equal power, making $Q_2 = Q_1$, the last equation would resolve into

$$Q = Q_1 \sqrt[3]{2} = 1.26\, Q_1$$

and the increase in air volume obtained would be only 26 per cent. of that of either fan running alone. It follows, therefore, that the quantity-increment due to placing one fan in series with another can never exceed 26 per cent. of the capacity of the more powerful of the two fans running alone.

We may take the investigation a step further than Walton Brown. By eliminating the quantity-factors between equations (1) and (2) we get a relation connecting the water-gages; namely,

$$h^{\frac{3}{2}} = h_1^{\frac{3}{2}} + h_2^{\frac{3}{2}} \qquad (4)$$

If the two fans were identical, h_1 would equal h_2, and equation (4) would become

$$h = h_1 \sqrt[3]{4} = 1.59\, h_1.$$

Hence it will be seen that the gage-increment due to placing two fans in series cannot exceed 59 per cent. of the gage-pressure generated by the stronger of the two working alone.

Experiment has well established the fact that the yield of a fan is directly proportional to its rate of revolution. This is a useful rule for the case we are discussing; for when the section of the mine served by the auxiliary fan becomes more extensive, it is necessary to meet the additional resistance or the additional demand for air by augmenting the speed of the fan.

The question then is, What increase of speed is required to bring about a given increase in air volume? Letting n_2 r.p.m. represent the required increased speed of the auxiliary fan and n_1 r.p.m. its speed when if operating alone it would circulate Q_2 cu.ft. of air per minute. By the rule stated, the auxiliary working alone at n_2 r.p.m. would produce $\frac{n_2}{n_1} Q_2$ cu.ft. of air per minute. Substituting into equation (3)

$$Q^3 = Q_1^3 + \left(\frac{n_2}{n_1} Q_2\right)^3 \qquad (5)$$

From this relation may be calculated the speed n_2 of the auxiliary so as to give a desired air-volume, Q, when the two fans run together.

Methods of Installation

Fans of the propeller type are rarely used in British colliery practice, although for setting in an underground roadway they have the advantage of giving a straight-line path for the air. Quick-running single-inlet centrifugal fans of the Sirocco class are most generally used in service below ground. Intakes being used for haulage, the fans are usually placed on the returns where they are out of the way of the traffic. Fig. 1 shows one such arrangement, the 40-in. single inlet fan F being driven by a belt from the motor M. Any required alteration of the speed of the fan is effected by changing the size of the pulley on the fan shaft.

The fan station must be well protected. In the case illustrated, the roof is supported by steel girders resting on side walls. The pass-by B is an essential provision, being needed by officials and others traveling the road, and is used when timber has to be taken past the fan or repairs made in the vicinity. The doors D_1 and D_2 are hung so that when F is running the pressure will keep them shut, yet should the fan stop for any reason, the doors will open by the suction of the main fan at the surface.

The partition H is of 1-in. tongued-and-grooved boarding, made so light as to act, with the doors, as a safety valve were an explosion to take place, the aim being to safeguard the fan itself as much as possible. By this arrangement, it will be noticed, it is necessary to turn the air, in passing through the fan, through an extra right-angle to gain the horizontal *évasé* E. Every such bend means of course some waste of power.

This difficulty is avoided by the arrangement illustrated in Fig. 2. This method of installation is convenient when the fan is placed in connection with an intake haulage road, allowing, as it does, of a straight-through passage for the haulage. When an underground fan is connected to a haulage road, doors unfortunately cannot be avoided.

Preferable Driving Power

Although power derived from falling water has been applied to small underground fans, ventilating "ends" in metalliferous mines, from a very early date, only two kinds of power—namely, electricity and compressed air—need be considered in discussing the modern application of these fans to collieries. If all the underground machinery at a mine is driven by compressed air, there is nothing more to be said; for any fan installed in the mine will naturally be similarly driven. But if the general power supply is electric, it is another matter.

One advantage of placing the fan on the intake is that an electrical drive is permissible. To run a fan on a return in airway in a gassy pit, however, and to drive it electrically when the motor room is ventilated by return air, is obviously impossible. It is risky even when the gas-content of the return air is normally well below 1 per cent. and when the motor and switch-gear are suitably protected.

Where safety is the paramount issue, we must reckon with the abnormal condition rather than with the usual. Gas may collect in dangerous amount through a temporary breakdown of the fan itself. In Great Britain the Mines Act requires the stoppage of electrical machinery should the firedamp content reach 1¼ per cent. Thus it might happen that a fan so driven would have to be stopped, to comply with the act, at the very time when it was most needed.

A successful way of circumventing this difficulty is to construct the motor room on the return, but at the end of a crosscut connecting with the intake, and to ventilate the place with fresh air carried in by a pipe. The end of the air pipe can conveniently be fitted with a shutter so that the air supply is under control. Should such a method be adopted, care must be taken to arrange matters so that every opening from the return to the motor room is on the inlet side of the fan, or else it would probably be found that, owing to the elevation of pressure caused by the fan, the air in the pipe ran in the opposite direction to that which is desired. The arrangement shown in Fig. 1, for example, would be

faulty if the motor room were intended to be separately ventilated with intake air, for the openings to the room are all on the delivery side of the fan.

Another way of meeting the problem of driving a fan in the return of an electrically equipped colliery is to employ an electrically driven compressor in a neighboring intake and to lead the compressed air so generated to an engine working the fan. It is outside the scope of this article to discuss at all fully the pros and cons of inby compression. When it is adopted by mine superintendents it is not usually because they like it, but because there is no other solution. It means increased first cost, greater costs of operation, more trouble, and roughly twice the risk of breakdown to the fan or other machine which is being driven.

Negative Water Gage and Its Effects

I have just said that underground fans may cause a flow of air from a return back into an intake. This is owing to the fan heaping up pressure on its delivery side. Thus a water-gage reading taken between a point on the delivery side of an underground fan and a point in an intake close by may be negative. Hence, if doors were left open in a road connecting two such points, a closed air circuit would be set up and the intake would be flooded with return air. Moreover, the direction of leakage through stoppings or through the waste in such a neighborhood opposes the usual direction.

When Prof. J. Cadman, of Birmingham University, England, was investigating the ventilation of coal mines on behalf of the British Royal Commission on Mines (Government Bluebook, Cd. 4551, p. 9), he found just such an instance. A 40-in. Sirocco fan was in use on a return inby. A main intake in its vicinity was found to be considerably contaminated with return air, which made its way from the return at an air crossing and through certain stoppings and doors. Cadman measured the difference of pressure between the intake and return at a point close to the fan discharge. He got a negative water gage of 3½ in. The return air near the fan contained 10 per cent. of blackdamp and ½ per cent. of firedamp—"a very undesirable mixture to leak into the intake," as Cadman correctly remarked.

With an arrangement of roads similar to Fig. 3, it is evident, then, that special care must be taken to prevent leakage from the return *R* to the intake *I*. If it is considered necessary to have doors in one of the crosscuts, they should be placed at *H*, on the inlet side of the fan, rather than at *D* or *E*. The brick stoppings in the connections *E*, *D*, *C*, etc., should be well-built, recessed into the sides and coated over on their intake faces with mortar. Fine rubbish should also be banked up solid for 5 or 6 yd. behind each of them.

If there is an excess of pressure in the return at *E*, that excess will be less at *D* and less still at *C*. So that as we travel outby we shall sooner or later reach a neutral point, where there is a zero water gage. It is useful, even at some trouble, to find the whereabouts of that neutral point, by actual trial, in order to ascertain the extent of the zone over which special precautions against leakage must be taken.

Effect on Other Splits of Air

Fig. 4 shows diagrammatically two air splits of different lengths. Before the auxiliary fan was put in at *F*, the splits obtained an air supply depending in each case on the difference of pressure between the points *A* and *B*; and to increase the resistance of the shorter split and to prevent it taking more than its share of air, a regulator was placed at *R*. When the fan started to run, it created an increase of pressure at *B* and therefore a smaller difference of pressure between *A* and *B*, and the flow of air into the shorter split was checked. The larger split got an increased volume of air, it is true, but at the expense of a decreased supply to the shorter split.

This is exactly what was found to have happened when the late Walton Brown tested the ventilation of the Browney Colliery Co., Durham, England, after a Schiele fan had been installed underground to help the ventilation in one of the seams. His measurements showed that the air supply to the other seams worked from the same shafts had suffered a diminution (see *Transactions* of the Institute of Mining Engineers, Vol. XXXIV).

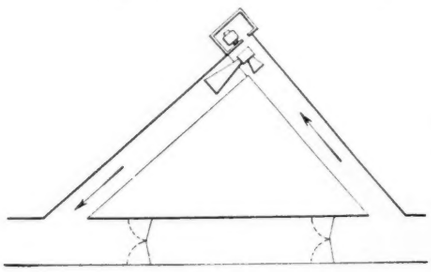


Fig. 2

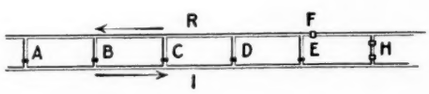


Fig. 3

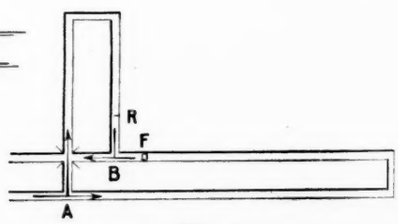


Fig. 4

FIGS. 2 TO 4. ILLUSTRATING SOME DIFFICULTIES ARISING IN THE OPERATION OF BOOSTER FANS

Now an influence of this character may not be harmful if small in magnitude, for it may be found possible—glancing once more at Fig. 4—to compensate for it by opening the regulator *R;* but if the fan is stationed close to *B,* that point may actually be within the zone of negative water gage. In that case the flow in the shorter split would be reversed and a closed-circuit current set up round the two districts.

A study of the underground fan therefore reveals that, useful though that machine may often be, it introduces a number of special problems and places some new difficulties on the shoulders of those responsible for the control and supervision of the ventilation of the mine.

At the Working-Faces, unless the coal is unusually brittle, there is not, generally speaking, sufficient dust to initiate an explosion. The dangerous accumulations of coal dust are almost exclusively confined to the main haulageways, and Professor William Galloway cites as the three main sources of dust: (1) Coal falling from mine cars which is ground by degrees into the form of dust by the traffic and carried by eddies and currents of air along the roadways. (2) Dust blown off the coal contained in the wagons during their transit from the working-places to the hoisting shafts. (3) Dust from the screens that is carried down the downcast in the descending air current.

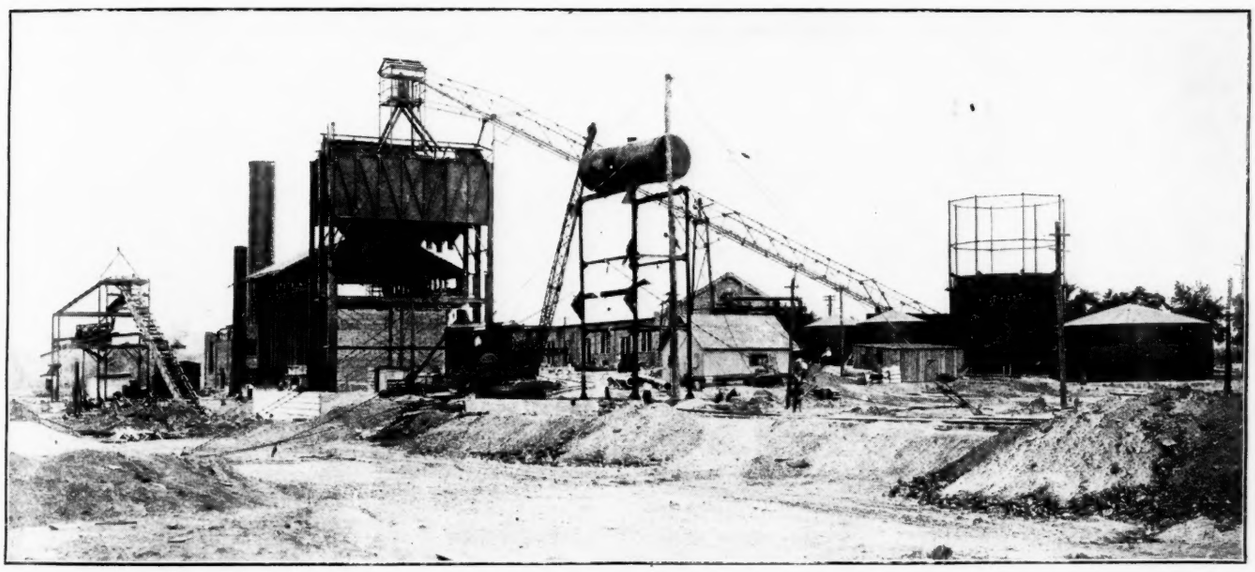
New Style of Coke Ovens

Throughout the country the attention of coke manufacturers and others interested in coke or byproducts of coal is turned toward Chattanooga, Tenn., where the first Roberts coke ovens erected are being operated by the Chattanooga Gas & Coal Products Co.

The inventor claims that from the standpoint of quick conversion of coal into coke these ovens will prove more efficient than any other type used in this country or even in Germany, where the art of coking coal is conceded to be the highest attained, economy and expeditious work considered.

If Mr. Roberts' design proves successful, gas and coke manufacturers expect it to revolutionize the coke industry in this country, and numerous visits are expected from Northern manufacturers.

Heat was started on the ovens—for the Roberts ovens are fired from the top in a way never attempted before—about June 1, and it was fully 30 days later that a sufficiently high temperature was reached to permit coking.



CHATTANOOGA GAS & COAL PRODUCTS CO.'S PLANT

A perpetual-motion process of operation is incorporated in the Roberts ovens; that is, each charge of coal is carbonized by the burning of gas generated by former charges. This made it necessary for the Chattanooga Gas & Coal Products Co. to contract with the Chattanooga Gas Co. for the purchase of gas to bring the ovens to their first heat.

Use of Powdered Coal as Fuel

At the seventh annual convention of the International Railway Fuel Association, W. L. Robinson, supervisor of fuel consumption of the Baltimore & Ohio R.R., presented a paper outlining the advantages that might result from the use of powdered coal in locomotive furnaces, and from this article the following costs of pulverizing are taken.

The cost of preparing powdered coal will vary with the cost and moisture content of the raw coal. However, a general average from available data covering periods of the past five to ten years at cement and metallurgical plants has made it possible to present a conservative estimate, assuming the cost of the raw coal at from $1 to $2 per short ton, and that it will require crushing and have a moisture content of from 5 to 10 per cent. when placed in the drier. The plant capacity is given in short tons per 10-hr. day and the cost given covers all the items of expense in the preparation of a short ton:

Capacity	Cost	Capacity	Cost
20	25 to 50c.	50	14 to 35c.
30	20 to 45c.	100	12 to 30c.
40	16 to 40c.	250	10 to 20c.

The fuel required for drying the coal will average from 1 to 2% of the coal dried. The total cost is distributed approximately as follows:

Fuel for drying	10%
Power for operation	30%
Labor	30%
Maintenance and supplies	25%
Interest, taxes, insurance and depreciation	5%
Total	100%

The cost of preparing powdered coal should be more than offset by the ability to utilize mine refuse and sweepings, run-of-mine, screenings and slack grades of coal that cannot be used to advantage otherwise, and inferior grades of sub-bituminous coals, lignite and peat of relatively lower cost per ton than the readily salable commercial fuels.

To feed the coal into the furnace in a finely divided or powdered state is the most advanced method of producing perfect combustion. While a cubic inch of solid coal exposes only 6 sq.in. for absorption and liberation of heat, a cubic inch of powdered coal exposes from 20 to 25 sq.ft., which makes possible a more uniform gas production from the volatile matter in the coal and more prompt and perfect intermingling of gas and air, thereby improving combustion and reducing smoke. Furthermore, there is no cooling of the fire by heavy intermittent charges of fresh coal, as is the case with hand or stoker firing on grates.

Powdered coal may be burned by either of two generally defined methods—the long-flame method, constituting a progressive burning of the coal such as is employed in cement and openhearth furnaces, and the short-flame method, which is the latest development and is used in metallurgical and similar metal-heating work or under boilers where a similar furnace volume obtains.

Variable-Speed A.-C. Motors for Driving Mine Fans

By F. B. Crosby*

SYNOPSIS—Means of changing the speed and consequently the capacity or water gage of mine fans are highly desirable if power is to be conserved. Heretofore alternating-current motors driving mine fans have been mostly of the single- or double-speed induction type. A variety is now available, however, that may be readily and easily adjusted through a considerable range of speed and which possesses meanwhile efficiency characteristics at least as good as those of the induction motor.

With the increasing complexity of industrial society, intelligent provisions must be made for the artificial maintenance of those conditions necessary to life which in the open are amply provided by nature. Generally speaking, impure water and vitiated atmosphere are more likely to be encountered in the vicinity of human habitation than elsewhere; particularly is this true as the variety and magnitude of industrial activity increase.

The continuous supply of properly diluted oxygen of the requisite humidity for public buildings, hotels, theaters, offices, factories, etc., as well as for subways, tunnels and mines is at last receiving a much-deserved attention. The humanitarian and economic advantages of substituting normal and healthful for abnormal and injurious conditions are beginning to be appreciated.

In its simplest terms ventilation is merely the exhausting of depleted air from and the blowing of fresh air into a confined space. The details of design of suitable devices for moving the air in such a manner as to obtain the pressure and volume required at a given point remote from the source of supply, with a minimum expenditure of energy, as well as the problem of most efficiently distributing this energy, are beyond the scope of these remarks, which must be confined chiefly to certain typical requirements for underground ventilation, together with the several systems of control which have been developed to meet such requirements. Two general conditions must be considered:

A. Those requiring approximately constant pressure or volume, such as tunnels, and subways of fixed dimensions and resistance.

B. Those in which the volume or pressure, one or both, must be varied frequently because of one or more of the following reasons: Increasing length and resistance of airways; economy in power consumption during idle periods, nights or holidays; to meet emergency requirements for increased pressure because of airways blocked by falling rocks; a temporary increase in the working force; to clear the mine of powder smoke or to sweep excess gas from pockets, etc.

For Constant Conditions Use an Induction Motor

For condition A there is no question that a standard squirrel-cage induction motor direct-connected to a suitably designed fan affords the simplest sort of installation, possessing high efficiency together with minimum maintenance and operating charges.

A direct-current motor can of course be used equally well, but as compared with the squirrel-cage induction motor the direct-current machine is subject to the disadvantage of a less efficient distributing system, which is an important point when, as is usually the case with mine fans, the air shafts are far removed from the power house. The direct-connected motor is handicapped also by a somewhat more complex starting equipment, commutator and brushes, which are wearing parts and which are not present in the squirrel-cage type of motor. Furthermore, the direct-current motor cannot be guaranteed absolutely sparkless under all conditions. This in the presence of gas is a vital objection.

In applying squirrel-cage motors, however, especial care should be taken to ascertain whether such a motor will start and satisfactorily accelerate the fan to full speed. With modern fans of small diameter with small Wr^2 or flywheel effect this feature need hardly be considered, but for large diameter slow-speed belted fans the character of the torque curve of the squirrel-cage type of induction motor is such that even if a given motor has sufficient turning effort to start the fan from rest without prohibitive current from the line, the torque increases so rapidly near synchronism that the belt is liable to snap or jump off the pulley.

For such cases a motor with phase-wound rotor and secondary resistance should be used. This will permit a much higher starting torque and will also give much smoother acceleration.

In discussing the second group, B, it is only fair to say that among mine operators there are two opposing camps. The one makes sweeping claims that variable-speed motors are never required; that all necessary speed changes can be obtained by using belt drive and changing the diameters of the pulleys. The advocates of this policy will sometimes admit the desirability of a multispeed motor, that is one which has two or possibly three constant synchronous speeds depending upon the external connections for corresponding polar groupings.

The other side claims always an advantage for the variable-speed motor. In the writer's opinion neither is always right. Where conditions approximate A the constant-speed motor is desirable as it is efficient, cheap and simple. Most metal mines and some coal mines are practically free from gas, and in older workings, owing to opening new headings and closing old ones, the same resistance may remain nearly constant for long periods.

The power required to drive a fan usually varies somewhere between the cube and square of the speed; consequently a two-speed motor of the changeable-pole induction type if operated at half speed when the men are out of the mine will save considerable power. If operations are carried on the full 24 hours this feature loses weight. If conditions are such that the fan must be speeded up from time to time, but never in emergency, the changeable-pulley method will serve within obvious limits.

*General Electric Co., Schenectady, N. Y.

In advocating this method, however, the cost of extra pulleys, belts and larger fan house, the labor of changing pulleys (which of course can be done only when the men are out of the mines), as well as the inability to take care of the emergency requirements mentioned under B, must be borne in mind.

In Ventilation All Precautions Seem Justified

Mining laws in many of the states are becoming more and more insistent on safety, the tendency being carried in some cases to absurd limits. In the matter of ventilation, however, all possible precaution seems fully justified, and to meet most satisfactorily the demand for absolute continuity of service at high efficiency under widely varying conditions of volume and pressure a variable-speed motor must be employed.

Until about three years ago it was necessary in such cases to resort to direct-current motors or motors of the phase-wound rotor induction type with variable external secondary resistance. The former is objectionable for the reasons mentioned. The induction motor with rheostatic control is chiefly objectionable because of its low efficiency at reduced speed.

The aggregate energy wasted in this manner throughout the country is enormous, as must be evident when the speed-torque characteristics of the induction motor are appreciated. There are in service today many large induction motors of capacities up to 1000 hp. driving mine fans, which have been in operation continuously with rheostatic control at from 30 per cent. to 50 per cent. speed reduction for periods of from 4 to 7 years. When operating at constant torque at reduced speed the input to an induction motor is practically constant and the secondary losses proportional to the reduction in speed.

If efficiency is plotted against speed and a straight line drawn from the point corresponding to full load efficiency and speed the efficiency for constant torque at any other speed may be read directly from the curve. With fan drives, since the horsepower varies roughly as the cube, and hence the torque as the square of the speed, the efficiency is still lower.

For very low speeds this may not prove serious from the standpoint of cost of energy, since though the efficiency is low the actual horsepower output is also low, but for ranges between 50 per cent. and 100 per cent. on large motors the excess cost of power over methods described below may easily amount to $2000 a year at the usual cost of power per kilowatt-hour.

In this connection it may be of interest to note that if

S = Slip in per cent. of synchronous r.p.m.,

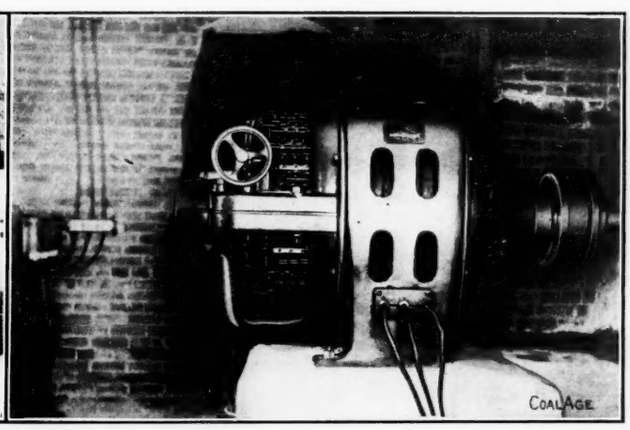
$1 - S$ = Speed in per cent. of synchronous r.p.m.

Then regardless of whether the torque increases, decreases or remains constant as the speed is varied, the total secondary or slip energy of the motor dissipated as heat with rheostatic control is always equal to $\frac{S}{1-S}X$ shaft output expressed in horsepower or kilowatts.

The fact that an induction motor with rheostatic control has a series speed characteristic and tends to accelerate to synchronism when the load is thrown off is not usually a serious objection, since fan loads are ordinarily quite steady.

Much effort and expense were undertaken by electrical companies in the endeavor to devise an alternating-current motor or system of control for such machines which would have the desired high efficiency, high power factor with variable or adjustable speed characteristics. In the spring of 1912 the writer had the pleasure of describing before the mining section of the A. I. E. E. at Pittsburgh several possible methods of obtaining speed control for fan drives and particularly two methods which although at that time still experimental in this country had been successfully applied some years previous in Europe.

A FAN AND MOTOR HOUSE AT AULTMAN, PENN., CONTAINING A TYPE PCS MOTOR



A TYPE PCS MOTOR DRIVING A 100,000 CU.FT. FAN AT AULTMAN, PENN.

Since that time both these methods have been modified and developed to meet the demands of American practice and a considerable number of the type PCS (polyphase commutator brush-shifting) motors in capacities up to 150 hp. and also the so-called type PCR auxiliary speed-regulating sets for use with standard induction motors for driving mine fans up to 250-hp. capacity have been in continuous use for varying periods up to nearly two years. Each of these methods has proved successful, and is worthy of more consideration than can be here given.

Construction of the New Type of Motor

The type PCS motor consists chiefly in a stationary part or stator with three-phase distributed winding similar to that of a standard induction motor. The rotor is similar to that of a standard direct-current motor, but is provided with a larger number of brushes so mounted that the entire supporting yoke can be rotated by means of a handwheel.

For convenience of design a series transformer is commonly used to supply current to the armature. A suitable oil switch with overload and low voltage features is usually combined with this transformer. The chief function of the transformer is to provide a low potential for commutation usually considerably less than 100 volts. This constitutes the entire control, which is by far the simplest ever devised for an electric motor excepting possibly the constant-speed squirrel-cage type of machine.

The motor is started, accelerated, stopped and reversed simply by shifting the brushes. This shifting is accomplished by means of worm gears and a handwheel conveniently mounted on the frame of the machine. If desired a small pilot motor can be used and the machine perfectly controlled from a remote point.

Since in effect the total number of ampere turns in the stator are equal to and in series with those of the rotor it is evident that with the brushes set in the same axis as the stator windings, the angle $a = 0$, and no field is produced by the line current. If the brushes are now shifted through an angle a, the balance between rotor and stator windings no longer exists, and the resultant ampere turns produce an excitation proportional to the current in both windings and to the angle of brush shift. The motor, therefore, will develop a torque proportional to the square of the line current and the angle of brush shift.

If the angle of brush shift is 180 deg., no torque is developed, since the stator field and rotor current are 90 deg. out of time phase. With brushes in this position, the magnetizing current only, which is about 10 to 15 per cent. of the normal full-load current is drawn from the line, and the main-line switch can be closed without starting or in any way injuring the motor.

If now the brushes are gradually shifted forward, the line current and motor torque increase slowly at first until the motor starts very gently. As the brush shift is increased the torque curve begins to rise rapidly, so that any desired value of starting torque within the limit of design of the motor in question is available. By actual tests some of these motors have started successfully and without appreciable sparking under 400 per cent. of normal rated torque. This value, however, is somewhat higher than could reasonably be expected in economical design.

Shifting the Brushes Controls the Motor

By merely shifting the brushes perfect speed control is obtained throughout, approximately 75 per cent. of the range from rated speed to stand still. In general 40 to 60 per cent. speed control is ample, and obviously a request for greater range should be avoided unless really necessary as the greater range means a more expensive machine except in certain cases like fan service, where the load falls off rapidly as the speed is reduced.

If the brushes are shifted beyond $a = 180$ deg. the motor will start in the reverse direction. In order to obtain the best commutation, however, it is necessary to interchange two of the primary phases. This reverses the rotating field of the stator, giving it the same direction of rotation as the armature. Commutation is sparkless from about 10 per cent. above to approximately 70 per cent. below synchronism.

The lower speed limit is determined by the torque characteristics rather than by commutation which is very good even to 90 per cent. below synchronism. In the higher range of speeds the torque increases rapidly for a given brush shift with any slight reduction in speed; consequently a slight change in the counter-torque of the driven device affects the speed but little. The converse is true, however, in the lower speed ranges so that the minimum permissible speed depends largely upon the torque characteristics of the load.

Efficiency and power-factor curves for a PCS motor as compared with similar values for an induction motor with rheostatic control show a material saving in power. Furthermore while the power factor of the PCS motor is lower at low speeds yet the apparent efficiency—that is, the product of efficiency and power factor—is much better at all speeds for the PCS than for the induction motor.

Unfortunately space prevents an adequate description of the PCR speed-regulating sets as applied to fan drives. Such a description will, however, appear in an early issue.

V. H. Manning is New Director of Bureau of Mines

On Aug. 27 President Wilson appointed Vannoy H. Manning director of the United States Bureau of Mines to succeed the late Dr. J. A. Holmes. A short sketch of the life and work of Mr. Manning is therefore interesting to the coal industry at the present moment.

Mr. Manning was born at Horn Lake Depot, Miss., Dec. 15, 1861. His father, Vannoy H. Manning, Sr., represented the Second Mississippi District in Congress,

VANNOY H. MANNING

The new director of the mining bureau is a graduate of the University of Mississippi, from which institution he obtained the degree A.B. He is married and has two children.

Mr. Manning is a member of the American Institute of Mining Engineers, the Washington Society of Engineers, Cosmos Club, National Geographical Society and the Delta Kappa Epsilon Fraternity. He is also a member of the Home Club of Washington, the Trowel Club and the Mississippi Society of Washington.

For more than 20 years Mr. Manning has been engaged in technical and scientific work under the Department of the Interior. From 1885 to 1910 he was engaged as a civil engineer with the United States Geological Survey, which work required his attention in nearly every state of the Union. In addition to his scientific work Mr. Manning has held a number of important administrative positions in the Government service.

When the Bureau of Mines was established in 1910 he was appointed to an administrative position in the bureau by Secretary Ballinger, and on Jan. 1, 1911, was made assistant director. In January, 1914, Dr. Holmes, who at that time was director of the mining bureau, was compelled to leave Washington and relinquish the active directorship of the bureau. At this time Mr. Manning was placed in immediate charge of the work, and from that time to the present he has served as acting director of the bureau.

During his service with the Bureau of Mines Mr. Manning has had charge of methods relating to appointments, expenditures and the conduct of investigations, loyally supporting Dr. Holmes in every effort to make the bureau of great service to the mining fraternity. Mr. Manning's attention to the details of the bureau enabled Dr. Holmes to devote his time to larger matters of policy and to the coördination of the work of the bureau with that of other Governments and private institutions whose efforts have been along lines of safety and efficiency in mining.

There is no doubt that the appointment of Mr. Manning to the directorship of the mining bureau is well deserved and will meet with the general approval of coal-mining people. His long years of service in Government administrative work and his popularity with his associates in the bureau and his friends outside qualify him to fill with entire satisfaction the important position to which the President has appointed him. The coal industry congratulates Mr. Manning on his advancement and assures him of its undivided support.

Production of Coal in 1914

The production of coal in the United States in 1914 was exceeded by that in only two previous years—1912 and 1913. In 1914 the total production of anthracite and bituminous coal amounted to 513,525,477 short tons, valued at $681,490,643, according to C. E. Lesher, of the Geological Survey. In 1913, the year of greatest production, the total was 569,960,219 short tons. In 1914 the value of both bituminous and anthracite coal decreased slightly more than the tonnage, but the decrease in anthracite, the more valuable output, was slight.

The production of anthracite in Pennsylvania decreased from 81,718,680 long tons (91,524,922 short tons), valued at $195,181,127, in 1913, to 81,090,631 long tons (90,821,507 short tons), valued at $188,181,399, in 1914.

The total production of bituminous coal and lignite decreased from 478,435,297 short tons in 1913, valued at $565,234,925, to 422,703,970 tons in 1914, valued at $493,309,244.

The decrease in the production of anthracite was due in part to mild weather during the winter in the area where it is used almost exclusively for a domestic fuel and in part to decreased exports to Canada.

The decrease in the production of bituminous coal was generally distributed over the country, but there were seven states in which the production in 1914 was greater than in 1913. Two of these states, North Dakota and South Dakota, produce lignite only, and make relatively small output. New Mexico's increase was due to ability to supply markets ordinarily furnished by coal from Colorado, which in 1914 suffered from a serious strike. The other states that showed an increase were West Virginia, Kentucky, Michigan and Oregon. The greatest decrease was in Pennsylvania, where output fell off almost 26,000,000 tons. The most notable decrease was in Ohio, where because of strikes the falling off in production amounted to more than 17,300,000 tons, or approximately half the total output of the state in the year 1913.

Ballads of a Coal Miner—VI

The Question

Written Expressly for Coal Age — *By* BERTON BRALEY

I WONDER if a miner guy like me
Has really got a right to have a wife.
I sure would like to ask my girl; but, gee!—
I ain't got much to offer her in life.

If I spoke true I'd simply have to say,
"I love you, girlie—yes, I do, for fair;
Come be my wife an' share a miner's pay
(Which ain't an awful lot for you to share).

"Come be my wife, an' plan an' scrimp an' save
To keep the wolf from snarlin' at the door,
An' fret each day for fear a fire or cave
Will finish up my shift forevermore.

"Come be my wife—yer home a miner's shack,
The kind you see in every minin' town;
An' take yer chance of strikes an' times that's slack,
An' breathe the cool dust always siftin' down.

"Come be my wife—I'll love you true an' sure,
An' when the babies come I'll love them too;
But probably we'll all be mighty poor
An' have a cruel time in scrapin' through."

It ain't just fair, I know, to ask so much,
An' yet I want her; so I guess I'll try
An' maybe we won't meet hard luck, an' such,
For I might be a pitboss, by and by.

Scientific Humidification

By J. I. Lyle*

So far as I am aware no mine has yet been humidified on a scientific basis or in fact in any manner that has been successful. Of those installations regarding which I have accurate knowledge, a few fundamental laws necessary for success have been neglected.

The temperature of a mine is fairly constant, varying with the seasons, so that in winter it is a few degrees cooler than in summer, with but slight fluctuations from day to day or even from week to week.

Generally a mine has sufficient humidity during the summer months, because its temperature is much below that of the outside atmosphere. In winter, however, when the outside air carries but little water vapor and the mine temperature is much higher, the relative humidity is necessarily low.

In order that the air used for ventilation may be able to carry sufficient water vapor to humidify the mine, it must be heated, either by its contact with the mine walls or artificially. The temperature to which it is heated must be at least that of the dew point desired.

Take a mine, for instance, with a temperature of, say, 60° F., where a humidity of 80 per cent. is desired with the outside air at 20° F. and containing 1 grain of vapor per cu.ft. Air at 60° F. and saturated carries 5.75 grains per cu.ft. With 80 per cent humidity, therefore, each cubic foot would have to contain 80 per cent. of 5.75, or 4.6 grains. Now saturated air at 54° F. will just hold 4.6 grains per cu.ft. It is evident from this that it is necessary that the air should not be less than 54° F. when the additional water vapor is added. If at any lower temperature it could not possibly hold the required amount of vapor to give the 80 per cent. humidity.

It must be borne in mind that water cannot be evaporated unless heat is added; or to state it in another way, if water is caused to evaporate in the presence of air without heat being applied, the air will be cooled 8° F. for every grain of water evaporated per cubic foot.

This being true, if the air entering the mine at zero is raised to a temperature of 54°, the only way the necessary moisture can be added would be by blowing steam directly into it. It is well known that the introduction of steam directly into the air current without the production of fog is a most difficult matter, if it may ever be said to be successfully accomplished.

With the case under discussion, with the incoming air containing 1 grain of vapor per cu.ft. it would be necessary to add 3.6 grains per cu.ft., which if done without adding heat, as explained, would cool the air to approximately 28° F. To counteract this cooling effect we could heat the air to 82° F. and then bring it in contact with atomized water sprays and add the 3.6 grains per cu.ft., and as a result of the evaporation it would be cooled to 54°. At this temperature of 54° the air would be saturated, but as it traveled through the mine and its temperature was raised to 60° the humidity would be lowered to 80 per cent. Such a system properly installed would give good results without any fog or other objectionable results. A simpler and more practical method is to first pass the air used for ventilating the mine through a humidifier, where its temperature is raised and the necessary amount of moisture is added simultaneously. Such a machine is now being adopted in textile mills for cooling and humidifying the air.

Here the air passes through a dense and finely divided water spray, where it is saturated. The water used is circulated by means of a centrifugal pump and is heated by the introduction of exhaust steam. Eliminator plates at the outlets are used to separate the surplus water from the air, so that the air is left perfectly free of any fog or other small particles of water that have not been evaporated. Because of the recirculation of the spray water employed by this machine, the amount of water required is small and is equal to that evaporated. This would never exceed 1 gal. for each 12,000 cu.ft. of air used.

The exhaust steam required to heat the spray water (which in turn would heat the air to 54° F.) would be 1½ lb. per 1000 cu.ft. of air handled. Of course, with a large ventilating fan this amounts to considerable steam, but in most mines there is sufficient exhaust going to waste to fulfill the requirements.

To summarize: First, it is necessary that the moisture for mine humidification be injected into the air after its temperature has been raised to approximately that of the mine. Secondly, this moisture must be added in such a manner as not to cool the air below the temperature required to carry the desired vapor. Thirdly, the injection of steam into the air at or near the entrance of the mine is sure to produce fog and cannot add the amount of vapor required owing to the temperature of the air being too low to carry it. Fourthly, the humidity of a mine can be maintained uniformly at a desired point by a properly designed humidifier, with heated spray water, located at the air entrance to the mine.

*Treasurer, Carrier Engineering Corp., 39 Cortlandt St., New York City.

Explosion in Somerset Field

The Orenda mine of the Merchants' Coal Co., at Boswell, Penn., was the scene of a disastrous explosion on Aug. 31. Boswell is located on Quemahoning Creek in Somerset County. A severe explosion killing five men occurred at Orenda No. 2 on Jan. 25, 1909. This more recent explosion caused the death of 16 men, most of whom were foreigners. It is said that, as in the previous explosion, it was gas, not dust, which exploded. There were 300 men working in the mine at the time.

It was hoped at one time that all had escaped, but it was found that the afterdamp had caused 14 deaths. Joe Mantok, however, was apparently killed instantly by the explosion. John Beegle, a motorman, died in a local hospital later in the day of injuries received, and three others who were badly burned are in a critical condition.

The C. F. & I. Co.'s Field Meet

Between three and four thousand coal miners and their families from all parts of southern Colorado attended the first annual field and track meet given by the Colorado Fuel & Iron Co. at Trinidad on Aug. 14. Two thousand miners took part in a parade. Walsen camp won the first-aid contest. The scores of the competing teams were: Walsen 99, Berwind 98, Morley 97 and Cameron 95. The contest consisted of four events.

Extension of Service of U. S. Department of Labor

Perhaps few of our readers are aware that the United States Government, through the Department of Labor, has inaugurated as a part of the Division of Information a country-wide employment bureau. It is the belief of those connected with the work that it will go far toward improving business conditions in the United States.

The underlying principle of the work is perhaps best expressed by the Secretary of the Department of Labor in the following words: "The Department of Labor has established distribution branches throughout the country for the purpose, on the one hand, of developing the welfare of the wage-earners of the United States and improving their opportunities for profitable employment and, on the other hand, of affording to employers a method whereby they may make application for such help as they need, either male or female, citizens or alien residents, and have their wants supplied through said distribution branches."

Comparative statistics show that there has been in some portions of the United States a surplus of labor, while in other portions there is a deficiency. It is believed that this condition will be almost, if not entirely, eliminated by this work. This will appear from the following explanation of the system under which the work is conducted. The United States has been divided into 18 sections, or "distribution zones," as they are called, and in each of these zones an employment office has been opened. These zones in nearly every case have been subdivided and branch offices opened under the jurisdiction of the controlling zone office.

Thus a large number of employment offices have been opened by the Government. At these places the employer who needs help, skilled or unskilled, can secure what he wants without any trouble or expense. No fee is accepted by the Government from those seeking employment.

Every postmaster in the United States is a representative of this employment bureau. At every postoffice will be found, on application to the postmaster, blanks for the use of employers in need of help and for unemployed persons seeking employment. These blanks are transmitted by the postmaster, free of charge, to the proper zone office, where they are registered. Proper help is then selected for the employer, either from applicants residing in the city in which the office is located, or from other applications on file. On the day the employer's application is received by the distribution office, a copy is sent to the Division of Information at Washington, D. C. At frequent intervals these applications are assembled and published in the form of bulletins, and distributed to all distribution offices, thereby making it possible for each office to know where help of any description is in demand and enables that office to furnish the information to anyone looking for work or workmen.

EUROPEAN WAR
IN EUROPE
WAR DON'T PAY LET'S CUT IT OUT AND LEAVE FIGHTING TO THOSE WHO WANT POVERTY AND RUIN
OPERATOR
MINER
IN UNITED STATES
COAL AGE

OPPORTUNITY NOW

Economy in Ventilating Mines With Purchased Power

By Thomas A. Mather*

SYNOPSIS—The use of purchased current has brought to the attention of many coal mine officials leaks in power consumption before unnoticed. Particularly in opening new mines, money may be saved by installing temporarily small fans and motors of a capacity sufficient for the immediate needs of the development, putting the permanent fan in place only when the mine has been brought practically to its capacity of production.

The advent of central power plants, which have demonstrated their ability to furnish power cheaper than it can be made in small quantities, has forced the consumers of current to practice more rigid economy. The receipt of the monthly statement from the power company, with the paying out of hard cash for the amount of power used, has opened the eyes of power users to the necessity of installing the most efficient electrical machinery in order to slow down the wattmeter as much as possible. This is also true of the companies that generate their own power at central plants.

Coal companies have always practiced economy in the making and the use of power (or at least they have thought so) even when they were most extravagant. It is not many years ago that they thought it economical to use the cheapest kind of steam boilers, regardless of their efficiency, because they got the coal at first cost. When they began to charge their power plants with the market value of the coal consumed they saw the falsity of their old ideas of economy, and today the mines are equipped, except in rare and isolated cases, with the most improved and efficient type of steam boilers and power apparatus.

A gradual change is taking place with the coal companies that are using purchased power. Since they are buying power their attention is turned toward equipping their mines with the most economical and efficient electrically driven mechanical devices. Yet after all this is the same old economy of power clothed in a different garb to suit the changes and varying conditions through which we have passed.

Minimum Current Consumption Is a Problem

The most difficult problem to solve at a new mine where purchased or central station power is used is that of the fan to furnish adequate ventilation with a minimum consumption of current.

The old idea was to install as soon as the mine was opened a ventilating fan large enough to provide a sufficient quantity of air for the mine when it had reached its maximum output of coal and the highest water-gage or pressure on the ventilation. Take for illustration a modern mine which will eventually require from 150,000 to 200,000 cu.ft. of air per minute with a water-gage of from 2 to 2½ in.; a fan to produce this quantity of air with reversible steel casing, together with the foundation and installation, will cost from $5000 to $6000 and will require an electric motor of from 100 to 125 hp. for driving.

A new mine will not require this amount of air until it has been developed to its maximum output, which may require several years to accomplish, and if the fan is slowed down to produce 50,000 cu.ft. of air, which quantity would be ample for the first or possibly the second year, the efficiency of the fan and motor would be only about 20 per cent.

Under these conditions it is almost prohibitive to use a large centrifugal fan until the mine is sufficiently developed to require at least 100,000 cu.ft. of air per minute, while the greatest efficiency would be obtained when the fan was producing its maximum quantity (150,000 to 200,000 cu.ft.) with a 2- or 2½-in. water-gage.

In order to get away from this enormous loss of power, a disk type of fan could be used to good advantage in ventilating new mines with purchased power during the preliminary work of opening and until the mine had been developed to such an extent that it required a volume of air in excess of from 80,000 to 90,000 cu.ft. per minute. A disk fan capable of producing from 70,000 to 90,000 cu.ft. of air per minute while the airways are short and the pressure low can be bought for one-sixth to one-eighth the cost of a 16-ft. centrifugal fan and can be operated with less than one-quarter the power that a larger fan would require in order to produce the same quantity of air.

Money Saved by Discarding Large Fan

I have in mind a new mine which was opened about 2 years ago. A 16-ft. centrifugal fan was installed and fitted with a 100-hp. motor. When run at a speed to develop about 65,000 cu.ft. of air per minute, the cost of the power consumed was about 75c. per hour, or $18 per day. This is at the rate of 365 times $18, or $6570 for a year. This fan was replaced by a 6-ft. disk fan, which is still in operation and developing 65,000 cu.ft. of air per minute with a ½-in. water-gage, and the actual cost of operation for one year was $1055.02—less than $3 per day, against $18 per day for the centrifugal fan. This means a saving in one year of $5514.98. In other words, the cost of the centrifugal fan has been saved by the use of the disk fan in one year. The 6-ft. disk fan is now working at its most efficient point, but I see no reason why a larger disk fan, one capable of producing from 80,000 to 85,000 cu.ft. of air per minute with a 1-in. water-gage, cannot be used while the airways are comparatively short and the resistance low.

When purchased power is being used there are a number of things to be carefully considered in determining the size of fan and motor to provide the ventilation during the opening and developing stages of a new mine. The rate of development and number of persons who can be employed from time to time will determine the quantity of air required.

*Inspector of Mines, 18th Bituminous District of Pennsylvania.

It is most economical, of course, to have as near the right size of fan and motor as possible so that each will be working at nearly its maximum and most efficient and economical capacity. Where conditions will remain nearly the same over a relatively long period of time, perhaps several years, as concerns the quantity of air required and the water-gage developed, the right size of fan and motor can readily be determined. But in new mines the quantity of air required and the mine resistance change so rapidly, owing to the steady increase in the number of employees and the constantly increasing length of airways, that a fan and motor of the right size are good for only a short period of time.

It Is Important That the Motor Should Be of Proper Size

The size of motor should be given careful consideration. The loss in a 100-hp. motor is about 10 kw., which means that the losses in a motor of this size operating a fan continuously for 30 days will be 7200 kw.-hr. With power at the rate of $0.02 per kw.-hr. this amounts to $144 per month. In a 10-hp. motor the losses would not be over 2½ kw., or 1800 kw.-hr. in a month, amounting to $36. This fact alone will justify the use of a motor of nearly the proper size.

In order to save the losses due to an oversized motor the best arrangement to ventilate a new mine would be to put in a medium-sized fan and drive it with a single-speed motor of sufficient capacity to operate the fan for about 6 months. A larger motor could then be used which would run the fan at its maximum capacity, which should be reached in another 6 months. The speed of the fan necessary to increase the quantity of air from time to time could be accomplished by changing the sizes of the pulley. A second fan could then be installed of sufficient capacity to provide ample ventilation until the mine is developed to nearly its maximum capacity, the quantity of air being increased as before by changing the size of the pulleys. By this method an enormous saving in power bills can be effected by the coal company before it is necessary to install a large permanent ventilating fan.

The type of motor should also receive careful consideration. In direct current variable speeds can easily be obtained which would make it an ideal motor for use on a ventilating fan during the opening and development of a new mine as the speed of the fan could be regulated to produce the required volume of air; but since the power furnished by the power companies is alternating current, motors of this type must be used. So far the various devices to secure variable speed on alternating-current motors are either costly or dissipate considerable power without doing any work, and as economy is the watchword a single-speed induction motor will no doubt be found to be the most economical.

In the future more attention will be given to the size and number of airways in order to reduce the velocity of the air current. High velocities mean high water-gages, which will require larger motors and will increase the power bills.

No matter how small the electrical equipment of a mine may be, if purchased power is going to be used the coal companies should engage the services of a competent mine-electrical engineer to make an estimate of their requirements.

"Extracts from a Superintendent's Diary"

Three weeks have passed since the soul of Arnold Cross passed into the great beyond, but his heartbroken mother seems to be unable to become reconciled to his tragic fate.

I received a letter from her today in which she poured out her heart to me, and the note of hopelessness and despair permeating every paragraph of the letter has had a most depressing effect upon me. The grief and the rebelliousness of the mother are almost too terrible to contemplate.

In her letter she tried to justify her rebelliousness. It seems to her that the awful mining disasters that rob mothers of their sons, sweethearts of their lovers and wives of their husbands are of such frequent occurrence in mining history that the womenfolk of the mines learn to look forward to them as possibilities from infancy and so are prepared for the ordeal if it finally overtakes them. And besides as a result of the numberless disasters of the past, mining villages must be filled with widows and mothers and sweethearts thrown into close sympathy and communion with one another by the memories of their menfolks sleeping the long sleep just over the hill.

It is all very reasonable to her, such possible reconciliation to a fate that has long been feared as inevitable; but she feels that her own case is so different. She had hoped against hope from the first day that her son took up mining that he would give it up in answer to her pleadings, and the terror that haunted her day and night was born of the fear that she might not succeed, but never of impending doom.

The depressing effect of her letter upon me was due to the memories that it inspired rather than to the things actually expressed. Just the single sentence about the sweethearts, wives and mothers drawn together by common sorrow started a train of recollections that reaches back into the first days of my mining experience and is interwoven with each of the years that have passed since then. The heartaches and the sorrows, the sacrifices and the forbearance—how they stand out now in bold relief and testify to the grim fortitude of the miners' women! Sprinkled through all of those years are pictures of homes broken up, families separated and romances shattered. In a twinkling of an eye the plans and the yearnings of years have been set at naught—generally not even time for a last farewell.

Occasionally, however, on a piece of loose rock or perhaps on a trap door, a last wish or a parting message is discovered by the rescue parties in search of bodies. It may be a simple request covering the disposition of scanty worldly possessions, or even keepsakes, or it may be a last declaration of love; but it is always written in a firm, bold hand showing that the writer was not afraid to die, and in his last moments, facing impending death, thought not of himself, but only of those left behind.

Such messages are in themselves pathetic enough; but the real tragedy comes when those who have been left behind attempt to live their lives in keeping with the last expressed wish of a loved one suddenly taken from them—mothers striving to hold their families together after the father's wages have been cut off forever; young girls trying to remain true to departed lovers.

How romantic it all sounds; but in reality the romance became tragedy long before it became a memory.

Reminiscences in Ventilation

By F. C. Cornet*

SYNOPSIS—Early testing of a pneumatic mine-ventilating machine by a committee of prominent French and Belgian engineers. Some amusing recollections. The advent of the Guibal centrifugal ventilator. Description of the pneumatic machine.

In connection with the subject of mine ventilation, I recall some incidents, in my early life in France, that may prove of interest to many who have seen or heard of Combes' "Treatise on Mining," which was published at Liege, Belgium, in 1846. This book was for many years a standard work in Belgium and France and contains much that is of interest at the present day. The author, M. Charles Combes, was an authority whose word was generally accepted as law in Europe on all mining matters.

It is interesting to read the report of a test made on a large pneumatic ventilator that had been erected on the Bois de Saint Ghislain mine near my old home in Belgium. The accompanying illustration, Fig. 1, shows the elevation of this early ventilator as it appears in Combes' "Treatise on Mining," to which I have referred. Similar machines were erected all over the Belgium and French coal fields during the period of 1828-1857, when they were finally displaced by the advent of the famous Guibal ventilator.

The test to which I have referred was made on Dec. 17, 1841, by a committee of prominent Belgian and French engineers, who spent an entire week in the effort to make the test exhaustive in every way. There were of course luncheons and banquets given, without which no decent affair of this kind or any other was ever pulled off in Belgium or northern France.

On the committee were M. Guibal, the Belgian who was soon to give to the world another ventilator that would speedily send to the scrap pile all the pneumatic machines then in use; M. Glepin, a Frenchman who had done much experimental work in an attempt to develop a centrifugal fan that would create a sufficiently high water gage to ventilate the deep, narrow, long and circuitous passageways and workings of the Belgian and French mines; and M. Combes, whom I have mentioned. The results of the tests made on the Bois de Saint Ghislain machine were recorded in due form by M. Glepin, the historian of the committee. Even the luncheons, banquets and menus, the flowers on the tables and the high quality of the wines are appropriately mentioned.

In his account, M. Glepin tells at length how he himself had previously installed two centrifugal fans at this same mine. The first raised the water in the tube to a maximum height of 0.832 in., and in order to maintain this gage he states that it was necessary to run the fan at such a speed that it soon had to be scrapped. M. Glepin then designed another fan to take the place of the one wrecked, and this was run continuously without mishap at a speed of 84 r.p.m., which was incredibly high for those days. At this speed the water gage rose to 1.82 in., which, however, was much too low to encourage the owners of the mine to deepen and develop the workings as they had contemplated doing.

It is certainly interesting to read M. Glepin's opinion of centrifugal fans, which was based on these two unsuccessful attempts to ventilate by this means the mine at Bois de Saint Ghislain. He frankly admits his failure and concludes, "while centrifugal fans will perhaps be used to handle large volumes of air at low pressures, they will never be able to create the high water gages necessary for the efficient ventilation of the deep mines of Belgium and France." He therefore advised the operators at this mine to install the pneumatic machine shown in Fig. 1, and was unwilling to charge the company a penny for his time and labor, which had resulted only in failure.

But M. Glepin not only lived to see that he was mistaken in his conclusions in regard to centrifugal fans, but he was the first to install a Guibal fan at the Carnieres mine. It may be assumed in truth that M. Guibal, who signed the report of the committee without hesitation (and he never signed anything that he did not believe), had at that time, 1841, no idea of the ventilator that he produced later and which made his name famous the world over.

An Amusing Incident

It was my good fortune to have studied at the School of Mines at Mons, under Combes, Guibal and Glepin. I was therefore well acquainted with these great men. This recalls to me an amusing incident of my boyhood when I was 10 years old and which shows there were also some notable women at that time, one of whom was Mme. Degorge, the owner and active manager of the Degorge Iron Works, where the Bois de Saint Ghislain pneumatic machine was designed and constructed.

She was a Belgian whose father, M. Legrand, had founded the iron works at the beginning of the 19th century, which at his death he left to his daughter, who had married a Frenchman named Degorge, a lawyer of Valenciennes, a city just over the border. The Belgian laws of those days did not allow a married woman to carry on business under her maiden name, which explains why the Legrand Iron Works became the Degorge Iron Works. Mme. Degorge was an intrepid woman and let her husband stick to his law business while she assumed the management of the works on the very day after her father was buried. She kept at it for many years, and few people who had any business with the Degorge works ever knew there was any M. Degorge. My father's home was not more than 500 or 600 ft. from the main entrance to the works.

The incident I am about to relate made such a deep impression on my mind that I shall remember the awe-inspiring Mme. Degorge to my dying day. It happened one afternoon that as I was returning from school this good lady captured me on the highway and carried me bodily to my father's presence and there accused me of playing some especially bad tricks on the works' gatekeeper, a portly gentleman hardly less dignified than his

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employer. I may say that the woman's act impressed me more deeply than the punishment administered later by my father.

Although the pneumatic machine to which I have referred has passed into history, a brief description of its working and capacity will be of interest, as showing with what difficulties those engaged in the early mining of coal had to contend.

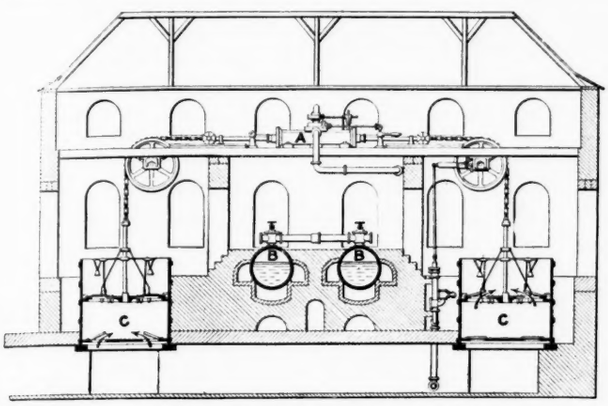


FIG. 1. PNEUMATIC MINE VENTILATOR

Description of the Machine

A brief study of Fig. 1 will serve to explain clearly both the machine and its operation. The figure shows two large vertical cylinders installed in a building which served as an engine room for the operation of the machine. Steam from the boilers entered the steam cylinder *A*, placed on a platform or floor above the boilers *BB* and in a position midway between the cylinders. The two air cylinders *CC* were open at the top, each being fitted with a piston, which is shown in plan in Fig. 2. Each of these pistons contained eight large valves, which were balanced as shown in vertical section in Fig. 1. A similar series of valves was arranged in the bottom of each cylinder. All the valves opened upward, and the action of the machine was exactly similar to that of a large air pump. The two piston rods were connected by a link chain with the piston rod of the steam cylinder. The action of the pistons was alternate, one rising as the other fell. As each piston rose, air was drawn from the mine into the cylinder, through the valves, as shown by the arrows at the bottom of the cylinder on the left. At the same time, the mine air which had been drawn into the cylinder on the right was discharged through the valves in the piston, as indicated by the arrows in that cylinder. It will be observed that one feature in which this machine was seriously lacking was that the mine air was discharged into the building, from which it had to find its way into the outside atmosphere. Beneath the air cylinders was a brick tunnel having an area of 38.64 sq.ft. and a length of 104 ft., extending to the top of the upcast shaft. This shaft was 811 ft. deep and was connected by a succession of tortuous passages or airways having a total length of 5667 ft. and an average sectional area of only 21.11 sq.ft. The downcast shaft was 1004 ft. deep. The sectional area of the downcast shaft was 94.07 sq.ft., while that of the upcast shaft was only 51.28 sq.ft. The surface elevation was the same at both shafts.

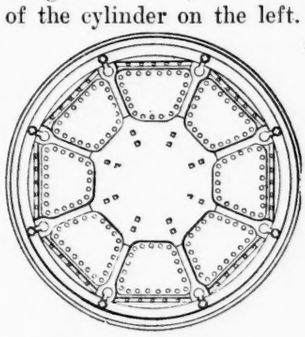


FIG. 2. AIR PISTON AND VALVES

Each air piston had a diameter of 11 ft. 9¼ in. and a stroke of 6 ft. 4 in. and made 12.8 double strokes a minute. At this speed a calibrated anemometer showed an air volume of 11,775 cu.ft. per min. The water in the gage oscillated at each stroke of the piston in a remarkably uniform manner from 2.308 in. to 8.724 in. This made the average water gage 5.516 in., and the power on the air was therefore $5.516 \times 5.2 \times 11{,}775 \div 33{,}000 =$ say 10 hp. Since the brake horsepower of the steam engine was 24.93, the mechanical efficiency of the apparatus was $10 \times 100 \div 24.93 =$ say 40 per cent., which compared very favorably with the efficiency shown formerly by the centrifugal fans—namely, 27 and 29 per cent. respectively.

Total Cost of the Installation

The expense of installing and operating this machine was enormous, especially when considered in respect to its small capacity for handling air. Following are some of the items showing the expense attending the construction, installation and operation of the machine:

The bill paid the Degorge Iron Works for the construction of the machine, boilers, piping and accessories complete was $8497.20. The cost of the installation, including the building having a slate roof, a 50-ft. smokestack and a brick tunnel beneath the building connecting with the upcast shaft, was $4210.24. This made the total cost for the construction and installation $12,707.44.

A record was kept for five years, showing the expense for continuous operation night and day, except five hours on Sunday when the machine was not in operation. This record showed that the annual cost to operate the machine was $2581.45, to which should be added for interest on the investment 6 per cent. and for depreciation 5 per cent., making a total of say $4000 a year for operation and maintenance. Following are the details of this average annual expense:

Wages, day time, one man at 50c. and one at 40c., $328.50; wages, night time, one man at 50c., $172.50; slack coal of inferior quality, 1642.5 tons, at $1 per ton, $1642.50; green soap to grease the pistons, 2422 lb., at 7c. per lb., $169.54; oil and tallow, $128.20; repairs, $140.21; making a total of $2581.45.

This expenditure for ventilation would at the present day be prohibitive in coal mining. Based on the circulation produced, the expense of operation and maintenance would be practically 92c. per 1000 cu.ft. of air per min.

Coal Mining in Spitzbergen

It is reported, says E. W. Thompson in *Commerce Reports*, that a Norwegian syndicate has purchased some coal-mining rights in Spitzbergen for about $300,000. Although Spitzbergen is one of the northernmost points of land in the Arctic Circle, navigation is possible there during a few months of summer.

Coal is becoming increasingly difficult for neutral European countries to obtain because of the employment in military service of many of the coal miners in England and Russia. It may therefore become profitable to obtain coal from points hitherto considered inaccessible.

The Labor Situation

SYNOPSIS—A strike in the spring hardly seems probable owing to the long period of slack work, the lessened demand for coal and the straitened funds of the union. The leaders seem to realize this fact. Destitution due to slackness of work is creating much uneasiness in Ohio and Illinois. The Industrial Relations Commission reports on the Colorado strike.

President John P. White, of the United Mine Workers of America, is talking preparedness and peace, and well he may emphasize the latter, for times are not propitious for a general strike, and he undoubtedly knows it. It is of course hard to know what will happen. The increase in wages which the machinists and oil men are receiving tends to make the miners anxious for a larger wage. The developments in the United Kingdom are also not without influence, and the cost of living as affected by the war also furnishes a reason for an increased remuneration. The miners are also anticipating in the anthracite field that they will receive a part of the income provided by lower freight rates should the price of anthracite in the market be sustained.

All these things tend to make the miners discontented, and the leaders naturally are afraid that they will get out of hand and forget that there are no resources available for a long struggle. The merchants in the anthracite region are preaching peace. They realize that the $2,300,000 weekly distributed by the coal companies is the lifeblood of their trade, and they are quietly urging a peaceful settlement. The Wyoming and Lackawanna region distributes $1,380,000, the Lehigh region $300,000 and the Schuylkill region $620,000 weekly.

These figures do not represent the whole loss that the field may sustain in case of a shutdown, because if the mines are not working the railroads will be idle also. The business men are afraid that if the winter is mild, the heavy stocks on hand will be sold in the spring whether a strike occurs or not, and business will not be any too brisk.

Destitution in the Hocking Valley

The situation in Ohio meanwhile is not bettered. The appeals for food and clothing for the miners have fallen on deaf ears. The people of Ohio are disposed to blame the miners and would rather give to men who are deprived of any kind of a living rather than to men who are idle because they are haggling or have been haggling for a price.

In the Hocking Valley 2000 miners are idle in the specific localities where appeals have been made for help. Only $6000 has been furnished to the Ohio National Guard for disbursement, and supplies have been purchased by that body for which $2000 is still owing. Adjutant-General Houet estimates that $600 worth of supplies are needed daily to provide adequately for the emergency. Unless winter brings the opening of mines now closed, the outlook will be desperate for the men who are at present idle.

In Illinois, Duncan McDonald, the secretary-treasurer of District No. 12 of the United Mine Workers Union, which covers that state, has issued a statement that 50,000 Illinois miners are out of work and thousands more work only one day a week. He says mining conditions are worse than ever before in the history of the industry in that state, and that the prospects for the winter are worse than they were at this time last year. Of the 286 local unions in the state, 89 have been out of work from a month to six months during the past half-year. In the other 200 locals, the work has been slack and men were lucky to get two days a week. About 16 mining concerns in the state have gone into bankruptcy during the year. One, at Benton, McDonald says, owed the miners $40,000 when it failed. In all, the miners have lost $100,000 in wages through mining-company failures. He says that conditions in nearly all the states are the same and that the nonunion miners in West Virginia are the only ones working full time.

The West Virginia operators are preparing to meet such assaults in a paper known as the "West Virginia Mining News," published by Wightman D. Roberts, of Huntington, the author of the pamphlet entitled "The Man with a Job," which was recently reviewed in "Coal Age." Karl F. Schoew, formerly a mine inspector in the Fairmont region, a contributor to the columns of this paper and now a coal-land broker in Huntington, will collaborate with him. Roberts was at one time editor of the "Appalachian Mine Record,' of Roanoke, Va.

Charles J. Albasin, of Bridgeport, Ohio, president of the eastern Ohio miners (subdistrict No. 5 of District No. 6), has denied that he is willing to accept an offer to succeed John Zalenka, of Brookside, Ohio, recently deceased, as secretary of the Pittsburgh Vein Operators' Association of Ohio. He denies also that the offer has been made.

Industrial Relations Commission Report

The Industrial Relations Commission made its report public on Aug. 24. Frank P. Walsh, the chairman, and the three commissioners representing labor found themselves in accord and signed a common report. These men were John B. Lennon, James O'Connell and Austin R. Garretson. The two commissioners who with Frank P. Walsh were intended to represent the public, John C. Commons and Mrs. J. Borden Harriman, signed a separate report. A third was signed by the three representatives of the employers.

The report of F. P. Walsh and the labor representatives declares:

Many typical industrial communities present every aspect of feudalism except the recognition of specific duties on the part of the employer. The employees in such communities are dependent on a single corporation or employer for their livelihood. Furthermore, the employer in many cases controls the social and political life of such communities, either by the complete absorption of local political powers or by domination of the local authorities.

The fundamental rights of citizens in such communities are as a general rule seriously abridged if not actually denied. Among the rights most seriously violated are freedom of speeech and assemblage and the use of public highways. In some cases, as, for example, in Colorado, employers in such communities have assumed to usurp the function of the Federal Government itself in the issuance of money orders, and have not only denied employees access to the post office when located in their company stores, but have opened and otherwise interfered with the mail directed to the employees.

The most extreme form of domination and control exists in what are known as "closed camps," where the employer owns all the land upon which such camps are located, and because of this private ownership, not only exercises control over the local government, but dictates arbitrarily who shall be permitted to come into or pass through such communities.

It is suggested that the commission recommend:

The enactment of appropriate state legislation providing that where communities develop, even upon privately owned land, the powers of the civil government shall not be interfered with, nor shall the rights of access to the residence of any person be restricted, nor shall the rights of persons to come and go unmolested, to speak freeely and to assemble peacefully be interfered with or considered to stand upon a different basis from the rights of persons in other communities.

That the Post Office Department be directed to report to Congress all communities in which the post office is in any company's store or other building operated by an employer or in which the postmaster is a private employer or the agent of an employer.

On Aug. 27 the report of George P. West to the Commission on Industrial Relations was given to the public. It deals mainly with the relation between John D. Rockefeller, Jr., and the strike in Colorado, and puts all the blame for the action taken upon him. Mr. West proves himself a master in abuse and an able lieutenant of Frank P. Walsh.

Governor George A. Carlson, of Colorado, bitterly assailed Frank P. Walsh on Aug. 29, stating that the people of Colorado, who are by no means all connected with the coal business, proved by their votes that they viewed the situation very differently from Walsh. He has since stated that the United Mine Workers of America has conspired to prevent the recruiting of the militia and has employed detectives for that purpose.

Welsh Strike Still Threatens

On Aug. 26 a thousand Welsh coal miners went on strike to protest against the arbitration ruling of Walter Runciman, of the Government Board of Trade. The trouble spread till 30,000 men were idle, and it was feared at first that all the 200,000 men employed in Wales would go on strike. The leaders appear to have tried to keep their men at work, but their endeavors were without avail until certain concessions were made on Aug. 31.

Apparently the main troubles were the exclusion of the surface workers and engineers from the same war bonus granted the miners and the limitation of the bonus to the continuance of the war. It is said that the mine owners have agreed that, while Runciman's award shall be allowed to stand, they will undertake to conclude a supplemental agreement which will give the engineers and surface workers what they demand. Unfortunately, however, on Sept. 1 the South Wales miners voted not to accept this understanding. Contrary to expectation they insisted that the war bonus be put in operation from July 22 instead of Aug. 21.

Use of Briquettes in the Pacific Coast Markets

Owing to the fact that screenings are a drug on the market, briquettes have played no inconspicuous part in the Pacific Coast trade, but so far have not been a success. One important plant was that of the Western Fuel Co. This concern had some time ago about 6000 tons of anthracite screenings on hand and briquetted some of these. They then curtailed the importation of anthracite and sold a great part of their briquettes. They have, however, quite a tonnage left, which is deteriorating. The plant has never briquetted Wellington screenings, and it has now been put in the scrap heap.

The brown lignite of the Ione Coal & Coke Co., which is very much similar to German lignite, is being experimented with for briquetting purposes. A German plant and system are being installed, and briquettes in the form of the German brown coal briquettes will soon be put on the market by that company.

In regard to the briquettes being made by the Pacific Coast Coal Co., it is said that 1200 tons were brought to this market. A report on them could not be obtained, but they are expected by the trade to be put on the San Francisco market.

A briquette known as carbon fuel is also being tried out in this market. This briquette is made by the Pacific Gas & Electric Co. at their Oakland plant. It is made from the residue of oil, which should be very dry before being used, and is broken up to a fine powder. No binder is used. Although a strong pressure is exerted on the briquettes, they are very soft when they come out of the machine and must be handled carefully. However, they harden after a while, and in fact become very hard under certain conditions. Wet winter weather is not favorable for that process, however, and the sale of the briquettes has therefore had to be stopped, as they were breaking up too much in this weather, and no sufficient dry stock has been kept on hand.

When burning, this fuel has an odor, and it smokes at first and then glows. It has no flame and is used mostly in furnaces. Its ash content is very low and carbon very high, the producer claiming over 15,000 B.t.u. It is an excellent steam fuel and will have to be taken into consideration as an important competitor in the Pacific Coast markets. At the present time, however, it is still in the development stage and is being experimented with.

American and Other Coal in Peru

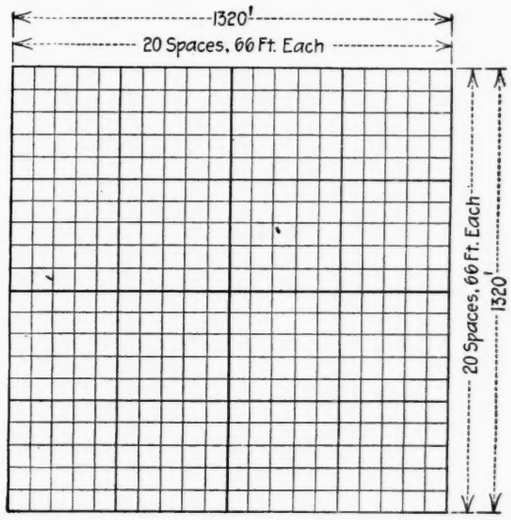
The importation of coal into Peru, says a supplement to *Commerce Reports,* fell from 150,660 tons in 1913 to 139,382 tons for 1914, which decrease is attributed largely to the embargo on shipping on this coast during the latter part of 1914 due to the presence of belligerent warships, the prevailing high freight rates from both American and European ports and to the establishment of modern coaling facilities at Panama, where many of the West Coast steamers now coal rapidly and at reasonable rates. The imports of coal from the United States increased from 11,461 tons in 1913 to 15,802 tons in 1914, but the imports from Germany fell from 32,696 to 12,044 tons.

The large proportion of imports from Great Britain, being 86,222 tons last year in comparison with 78,958 tons in 1913, may be attributed to the old trade that has existed between the West Coast of South America and Wales for many years, the product being brought out in sailing vessels or tramp steamers, which usually return with cargoes of sugar, cotton or nitrates from Peru and Chile, and also to the fact that belligerent warships occasionally used these ports for coaling purposes.

Obtaining the Approximate Area of Irregular Plats

By F. F. Jorgensen*

A plat of squares made on tracing cloth or paper, as in the accompanying illustration, is a convenient means to employ in obtaining the approximate area of irregular pieces of territory. This plat represents 40 acres on a scale of 200 ft. per in. and is divided into 400



PLAT FOR OBTAINING AREA OF IRREGULAR PLOTS; EACH SMALL SQUARE = 1/10 ACRE; SCALE 1" = 200

equal squares representing one-tenth of an acre, or 4356 sq.ft. each. These small divisions are 66 ft. square, but they may be made as small as desired when it is necessary to obtain results closer than one-tenth of an acre.

If these divisions be reduced to 33 ft. on the side there will be 1600 equal squares in the plat representing the 40 acres, and each square will represent one-fortieth of an acre, or 1089 sq.ft. With 20-ft. divisions representing .009+ acre, or 400 sq.ft. each, there will be 4356 equal squares in the plat. With divisions of the last-mentioned size very accurate results can be obtained.

This plat is convenient to use with mine maps in estimating the acreage worked out each year. The method of using is as follows: Lay the plat on top of the map, making the side lines of the plat correspond with the 40-acre lines on the map. Then count the number of squares that cover the territory the area of which is required. To aid in this counting the lines dividing the plat into quarters and sixteenths are made heavier than the others. For old maps or ones with light and indistinct lines it is necessary to make the plat on extra-transparent tracing cloth or paper.

The plat may be made any size desired, but for maps made on the scale of 100 or 200 ft. per inch I have found the plat representing 40 acres the most convenient.

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Mining Coal in Italy

The only mines of importance in this district, says Consul F. T. F. Dumont, of Florence, Italy, in *Commerce Reports,* are those of coal, sulphur and petroleum. Even these mines are extremely small compared with similar mines in other countries.

The coal deposits occur principally at Castiglia, near San Giovanni Valdarno, Province of Arezzo, and are estimated to contain approximately 17,000,000 long tons of lignite coal known as "lignite Xisolide." It is likely that a more thorough investigation of the limits of the field would materially increase this estimate. Outcrop due to wash occurs in a few places, but generally speaking, and where the principal mine is located, the top of the deposit is about 300 ft. under the surface. The vein averages 75 ft. in thickness and is mined in 6-ft. benches. Speaking in a geological sense, the coal is very young, having scarcely passed beyond the stage of wood. Trunks of trees are found the wood of which shows considerable resiliency. About 35 per cent. of water is found in the coal mined. Interspersed throughout the deposits are infiltrated deposits of clay running from 1 to 6 in. in thickness. The coal when burned gives a large quantity of ash even up to 50 per cent. The part most resembling wood is, after drying in the yards, sold in neighboring cities and villages for heating and cooking purposes, its cost delivered f.o.b. Florence being about $2.70 per long ton.

A large plant for furnishing electric power and light has been erected at the mine mouth which utilizes the poorest coal and waste. The plant is well and economically arranged and is equipped with the most modern machinery. The amount of power used for the machinery of the mining operations is small. The coal is very soft and the use of cutting or drilling machines is impossible. It is broken down by hand and loaded in small mine cars. An inclined plane runs from the surface to the level, and after a sufficient number of cars are collected at the foot of the incline, they are coupled together and hauled up the incline by cables operated by electric motors. The cars are either unloaded in the yard where the coal is spread for drying, or else unloaded directly into railway cars. No other machinery is used in the mine except a few pumps operated by electric motors. The 700 miners turn out 1200 tons per day of 10 hours and receive from $0.58 to $0.96.

The Coal Industry of Belgium

In 1913 the total production of coal in Belgium, says *Commerce Reports,* was 22,841,500 tons. During the first six months of 1914 the production was normal. During the last six months the production has been about half the normal. About 105,000 miners have been at work since the war broke out, as compared with 147,000 usually working in the mining districts of Belgium. The whole industry stopped in August when the Germans entered these districts.

In the province of Liege work first stopped in August. It was resumed partly in September, and the production went up progressively as follows: In October it was 25 per cent. of the normal production; in November it was 30 per cent.; in December, 40 per cent.; in January, 45 per cent.; in February, 50 per cent.; and in March, 50 per cent.

In the province of Hainaut, the Mons and Charleroi districts are to be considered. The work in the Mons district was especially affected from Aug. 23 to Sept. 15, when fighting was going on in these parts. Work was resumed in November; 80 per cent. of the workmen began work, and in order to employ them all, they were divided in shifts working alternately every two days. The production was 45 per cent. of the normal production in November and 50 per cent. in December. In the period January to March, 1915, 65 per cent. of the normal production was attained with the same number of workmen. In the Charleroi district the population was much affected by the war. Only 60 per cent. of the miners resumed work in November, turning out 30 per cent. of the normal production. Since December the situation in Charleroi has improved a little. All production and all stocks were put under the control of the German central bureau at Antwerp. This bureau has power to sell to manufacturers, owners of works, dealers, etc., at prices fixed by itself. The proceeds of the sales are handed to the mine owners after the deduction of a commission to cover expenses incurred by the central bureau. All contracts made before the war or since the occupation are void, and mine owners cannot be considered liable to damage for nonexecution of such contracts. In special cases contracts may be executed with the authorization of the central bureau. This bureau regulates production, sales and prices over all the occupied parts of Belgium. Coal is in little demand now except for domestic consumption.

The Song of the Mine Fan

By Michael Bernard

CASED in a shell of steel
Over the uptake shaft,
Here thru the livelong day to wheel,
Causing the upward draft;
Sucking the moist, dead air
Out from the nether murk
Into the noonday's brilliant glare—
This is my ceaseless work.

Into the gloomy pit,
Off through heading and drift,
Sending the air by many a split
Down to the working shift;
Sweeping the gas away,
Carrying off the damp,
Making a clearer, brighter ray
Shine from the miner's lamp.

Turning of arm and blade,
Tireless, swift or slow,
Sending the breath of life to aid
Those in the mine below;
Whirring and pulse and purr,
Surge like a surfy sea,
Keeping the clean, sweet air astir—
This is the work for me.

Editorials

The Purpose of Injunctions

An injunction is a legal means of preventing a wrong for which the law itself cannot or may not be able to furnish a remedy if once the wrong is committed. It was never looked upon as a menace by any of the public till it was applied in labor disputes, and then it appeared to the enjoined as a peculiarly iniquitous proceeding.

Applied to a capitalist or a corporation—and frequently was it so applied—its action appeared wholly commendable. Nearly everyone can see why Morgan or Rockefeller should not commit a wrong and escape the law, or why he should not be allowed to perform some improper act which for some reason can never be entirely corrected even though eventually he may be punished for his wrong action. But almost no one is of that opinion with regard to labor. Some in fact believe that labor has the characteristic of royalty—it can do no wrong.

Recently in Charleston, W. Va., certain miners secured an injunction on the Boomer Coal & Coke Co. restraining it from paying the monthly check-off to President Thomas Cairns and Secretary J. M. Craigo of District No. 17 of the United Mine Workers of America. They recognized in the injunction process an opportunity to secure their rights or what they imagined were their rights in the union. The union leaders, they declared, had secured their perpetuation in office by all manner of trickery, and though these officials were exonerated on trial by the executive board, still there was dissatisfaction, and so these men who normally would be the first to denounce restraining court orders became among the first to demand them.

In District No. 9 a similar use of the ancient principle of injunction has occurred. Judge Brumm, at Pottsville, Penn., has issued a permanent injunction restraining the officers of the executive board of the United Mine Workers of America of District No. 9 from suspending Thomas Butler from membership in the Girardville local. The officers had charged Butler with daring to express his opinion. He had criticized unfavorably some mining legislation in which they were interested, and it was alleged that he did so with the object of disrupting the union.

The union officials in Butler's district deny to union men the right of private judgment. Everyone must think or appear to think as they do. And the miners in that district by their supiness to such dictation seem to demand not only that their elected leaders should be amenable to discipline of act and word, which would to an extent be right as they represent them and accept pay for their services, but they require the same of every individual in the union and the right to punish everyone who takes a different view.

The utter dishonesty of the attack by members of the union and by the *United Mine Workers' Journal* on the trustees of the University of Pennsylvania for the discharge of Professor Scott Nearing, a teacher of economics, is made clearly apparent. Nearing was employed to teach; he was not a mere student paying his way, but an official. A certain amount of leeway should be allowed him of course. Perhaps the trustees were wrong in dismissing him; but if they were, their action was far less reprehensible than that of the officials in District No. 9. Surely a mere union member who pays in to the funds of the union has a right to freedom to vote, to recommend and to plead with fellow-members in the organization to which he belongs. To deny his right to membership and to freedom of speech is to deprive him of the most elementary prerogatives of the individual.

The case was clear, and Butler was absolved of the charges by his local, but the district board stepped in and suspended him from membership for six months, adding as a further penalty the provision that he should be ineligible for office for a period of two years. In giving his opinion the judge ruled that criticism of pending legislation is a personal privilege of every man, so long as it is neither libelous nor slanderous.

Butler has announced himself as a candidate for district president, an office to which he has heretofore aspired. It is clear that had he been shut out of the union he could not have run for office and it would have been difficult if not impossible to have compensated him for the loss of the honor he sought as leader of his fellows.

So the courts have appeared—as so often before—in defense of personal liberty. The injunction is the tool of everyone who has both the need for it and a right purpose for its use. It is the tool of labor when labor is right and the defense of capital when capital needs its protection. The recent actions in West Virginia and Pennsylvania well illustrate its adaptability to the cause of freedom and the public good.

Industrial Relations Commission

This body, which might well be termed the Commission for Disturbing Industrial Relations, has run its evil course. Its cost cannot be limited to the half a million dollars which was actually expended on it. The wages of agitation are immeasurably smaller than the damage it may cause.

The chairman of the commission, Frank P. Walsh, had an excellent opportunity to perform a great service to his fellow-countrymen. It was his role to act as a great father confessor to the industrial public. He could have induced them one and all to acknowledge their petty meannesses, their low aims and their violations of the law. He could in addition to hearing such confessions have carefully staged for the benefit of the public all those admirable actions and worthy intentions which employers, employees and their respective organizations had done.

But Frank P. Walsh had no such intention. He never for one moment forgot he was a lawyer and a politician. It was not his purpose to unveil the whole truth, only

to uncover the peccadillos or larger offenses of those who had quarreled with those people whom he regarded as his clients—the few working people who seethe with discontent and revolt, especially that foreign population which believes itself commissioned to regenerate the United States.

The report of the majority of the commission has already been cast in Uncle Sam's ample waste-paper basket, and Walsh himself will soon be in the discard with the document to which he has signed his name. No one can tell why President Wilson appointed him, for the Chief Executive is the very antithesis of Walsh. He believes in seeking for the best in men and advocates always perseverance and fairness. It was a mistake and one which he has doubtless often regretted when he appointed so unfair a man to such a responsible position.

The plea for the confiscation of estates exceeding $1,000,000 which forms part of the Walsh report is one of its most unfortunate features. The most useful fortunes we have are the large ones. An estate worth $1,000,000 drawing 6 per cent. will provide the owner with $60,000. The millionaire can and often does spend that amount of money in luxurious living.

But the man with a larger fortune is physically unable to spend the income on himself. He may spend large sums in building fine residences, but such money is rather an unprofitable investment than an expenditure, as it lasts for more than one generation. But usually he is utterly unable to spend any large part of his income on his follies. Perhaps 1 or 2 per cent. only is so spent. The rest goes back into business, and thus increases the national wealth. Such a fortune is almost as impersonal as if it were public property, and the placing of such an inheritance under trust restrictions, which Walsh deplores, only completes the quality of impersonality.

It is true that the possession of great fortunes does create industrial unrest largely because of the ability of leaders to use them in fanning into flame a spirit of jealousy. Actually the feeling is far more likely to arise from the presence of the merely well-to-do people who, living near the less fortunate, are more likely to arouse their envy. There seems an unfairness also in large inherited fortunes, and these two objections to them are so strong and reasonable that some animosity toward them is to be expected. Moreover, the political and moral power accompanying great wealth is in a degree a menace to our free institutions, and the possession of a fortune not infrequently undermines the character of its owner and that of those with whom he associates.

But if we clip those fortunes off short, as Walsh and his friends would wish, and apply the money to the extension of education, road building, irrigation, reforestation and the development of those other "important social services which should be properly performed by the nation," are we sure that the country will be more effectually benefited than it would be if the owners of that wealth still had it and still realized that it should be put out where it would at least not depreciate in value?

The possible uses of wealth that Walsh enumerates all have a real value, but still they are by no means without alloy. Reforestation has almost never been conducted at a profit in this country. Irrigation has been a sincere source of regret to many who spent their money in it. Road building as conducted has shown itself to be, not an investment, but a perennial tax. Social service means supplying to persons something they will not save for themselves. Even education is often of doubtful advantage, merely unfitting those receiving it for active toil. Perhaps all these might be made profitable, but evidently Walsh is not advocating them for their economic advantage. He makes no attempt to prove that an expenditure of money on them will be industrially productive.

The rich man may waste his money, it is true, in such unprofitable enterprises, but at his own and evident peril, and he seems to realize that fact better than the public. Some day the people may learn a truer economy, but at present investments that no foolish son of a rich man will venture to tackle, much less the astute father of that foolish son, have a great attraction to the national and state legislatures.

Instances of such expenditures are the improvement of the antiquated Erie canal, which will never pay the interest on its cost, however calculated; the construction of public roads, which last two or three years and need rebuilding at the end of that time; the digging of the Panama canal, which does not pay a dividend and may not pay its upkeep; the national expositions, the erection and operation of which possibly do not educate the public in proportion to their expense, and so on. A nation, like a workingman, will of course spend some money unproductively.

But the point is that the rich man is obliged to expend his money economically or lose it. The public does not seem to realize that it is in the same predicament. It is willing to take these accumulations, drag them away from found and developed profitable uses and throw them to the four winds careless of any future crop.

By greed, by cunning, by qualities perhaps which we do not like as well as by diligence, by intelligence, by self-denial and foresight the rich man sees that his goods increase. He is the source of our economic future. Take his money from profitable employment, spend it for him, educate men, if you will without regard to the ability or willingness of the educated to make a return, provide baths, amusements, comforts and what not for those who will not save to buy these things, and what results? The capital saved for future development is expended in gratifying the wish of the moment.

The time is ripe, owing to the war, for the United States to be the leading financial country in the world. But just now it is the most illiberal nation on earth to its railroad and bituminous coal capital if not to some other forms of investment. If in addition it becomes even worse than Great Britain to inherited fortunes it will never be anything else than financially a vassal to countries where profits are permitted—unless a miracle occurs and the lavish American citizens become as frugal or more frugal than those of France and so make up by saving what is denied as profits.

If any confiscation of our American fortunes comes at the behest of our foreign population—O stranger from less happy lands, if you see anything you want don't fail to ask for it!—it is to be hoped that the money will be put or kept in commerce and permanent profitable construction and not into a hundred and one uneconomic purposes which merely serve to allay poverty, but which do not create that power of production which not only relieves need, but actually in perpetuity removes it from all those who will work and save a little.

Sociological Department

Mine-Rescue and First-Aid Meet at Clealum, Wash.

By E. Jacobs*

SYNOPSIS—Another meet showing how loyally the labor unions in Washington are supporting the mine-safety movement, giving time, money and influence to its support. The contest was held on the village street.

The second annual state-wide mine-rescue and first-aid meet in the State of Washington was held at Clealum, Wash., on Saturday, July 31, by the miners and operators of Washington under the auspices of the United States Bureau of Mines, the State Mine Inspection Department and the American Mine Safety Association. The proceedings were under the direction of an executive committee and representatives of the United States Bureau of Mines, but a local arrangement committee relieved the general executive of much of the work of preparation.

The executive committee consisted of J. J. Corey, United States Bureau of Mines; James Bagley, state inspector of coal mines; Martin J. Flyzik, president of District No. 10, United Mine Workers of America, and D. C. Botting, commissioner, Washington Coal Operators' Association. The United States Bureau of Mines was officially represented by H. M. Wolflin, of San Francisco, Calif., mining engineer, and W. D. Ryan, of Kansas City, Mo., mine safety commissioner. The local arrangement committee consisted of A. A. Batterson, Joseph Parker, J. V. Hoffler, A. W. Hodder, Oscar Haltern, J. E. Morgan, John Lera, Thomas Summerill, Fred Zentner and Elijah Burge. Simon H. Ash, deputy state inspector of coal mines, and David J. Price, engineer investigating cereal-dust explosions, Bureau of Chemistry, United States Department of Agriculture, were the official scorers.

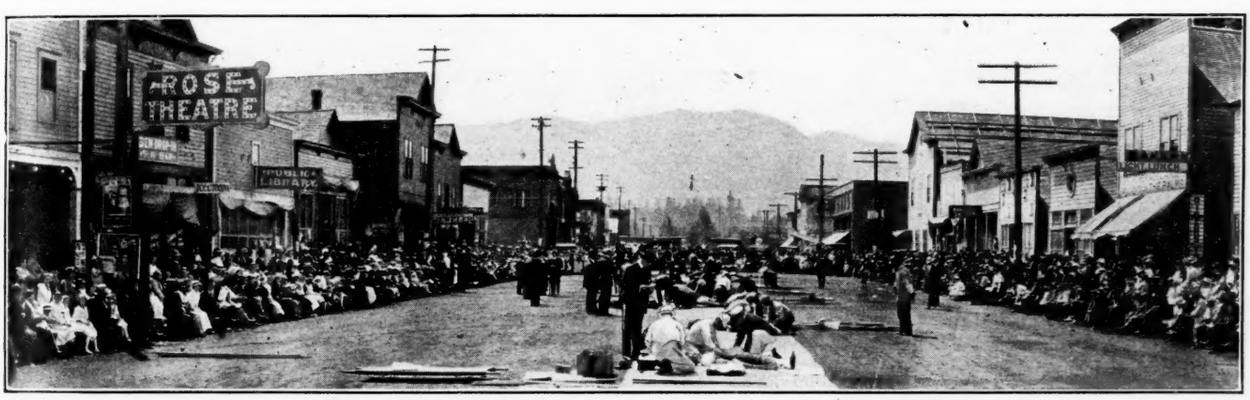
MEET HELD ON VILLAGE STREET

The first-aid contests took place in the morning in the heart of the town of Clealum, a part of Pennsylvania Ave. the full length of one block having been roped off. A good surface measuring 95x25 paces had been prepared along the center line of the roadway. This was watered and rolled. Seats were arranged all around this novel "field" for the comfort of the spectators, of whom fully 2000 were present. Interest was general, and the large attendance, together with the enthusiasm freely shown, gave practical evidence of the growing favor for first-aid work. Many of those competent to express an opinion declared that nowhere else in the Northwest have interest and enthusiasm been so strongly marked and so general as at this state-wide meet.

The gallery erected for demonstrating the explosibility of coal dust was constructed by the citizens of Clealum out of material furnished by the Northwestern Improvement Co., of which C. C. Anderson, of Tacoma, Wash., is general manager.

The two silver cups offered for competition were donated before the annual meet in 1914 by the E. I. du Pont de Nemours Powder Co., with the condition that they should be retained permanently by any team winning them at two consecutive state-wide meets.

Among other donors, District No. 10 of the United Mine Workers of America gave $25 for prizes in the four-man event, and the Clealum local, No. 2512, of the same organization, presented $20 for prizes to the winning teams in mine-rescue and first-aid events. The Roslyn Cascade Coal Co. gave $25 and the citizens of Clealum gave cash to be awarded to the winners. The townsfolk also assisted in other ways. The Clealum Eagles' brass band rendered instrumental selections throughout the morning in town and in the afternoon played at Ball Park, where the mine-rescue events were held.



INSTEAD OF GOING TO THE BALLGROUND FOR THE FIRST-AID CONTEST, THE WASHINGTON STATE SQUADS USED PENNSYLVANIA AVENUE, IN CLEALUM, FOR THAT PURPOSE

The following doctors judged the first-aid events: D. O. Kearby, F. W. McKnight and Charles F. Stafford, of Clealum; A. L. McClenahan, of Ellensburg; George H. T. Sparling, of Newcastle; H. J. Davidson and B. J. Lloyd, of Seattle, and J. W. Mowell, of Olympia, surgeon to the Washington Industrial Commission. Dr. W. N. Lipscomb, American Red Cross industrial surgeon, who is engaged in Red Cross work in the state, acted as field surgeon. Dr. Sparling also assisted Dr. Newgard, of Roslyn, in the mine-rescue events, by taking the temperature of the competitors.

FIRST-AID CONTESTS

The actual program of first-aid events was printed, but its contents were not revealed to any but the committee until the teams were on the ground ready to undergo the trial of their skill. It was as follows:

Team Event—Driver is caught between cars and sustains a compound fracture of the left thigh, resulting in severe arterial hemorrhage, and simple fracture of the right upper arm. His right eye is badly bruised and his right ear is severely torn. Treat, improvise stretcher and carry 50 ft. Time, 15 min.

One-Man Event—A man has been overcome by gas. Owing to the lowness of his working place it is impossible to carry him in an erect position. Bear him 20 ft. to a place where the bearer has room to stand upright; then carry him 20 ft. by the "shoulder carry." Perform artificial respiration by the Schaefer method for one minute. Time, 7 min.

Four-Man Event—A miner is rescued after falling into a chute. His right shoulder is dislocated and four ribs are fractured on the right side. He has a severe scalp wound

*Post Office Box 645, Victoria, B. C.

AFTER THE CONTEST THE FIRST-AID AND MINE-RESCUE CORPS LINED UP AND

above the right ear, with hemorrhage. Treat, improvise a stretcher and carry 100 ft. over an obstruction. Time, 20 min.

Two-Man Event—A man falls on an electric wire, face down, and is rendered unconscious. Rescue, using safety-first methods; perform artificial respiration for two minutes. Time, 6 min.

Three-Man Event—A car runs down a room and catches the motorman. His lower right arm and hand are badly mashed, and severe arterial hemorrhage follows. His left leg is cut and severely bruised above the knee. Treat and load on a stretcher. Time, 15 min.

Team Event—A miner having omitted to timber or take down a piece of cap rock is caught when it falls. His spine is injured, his left foot is badly smashed and right leg is fractured below the knee, his nose is broken and his lower jaw is fractured. Treat, carry 50 ft. under cave which still permits of 3 ft. of clearance. Stand in upright position to show work. Time, 20 min.

Four-Man Event—A miner has been rescued following an explosion and has sustained the following injuries: Burn on back of head and neck, simple fracture of right leg below the knee and compound fracture of the kneecap of the left leg. Treat. Time, 17 min.

The discounts recommended by the American Mine Safety Association were those used. These will be found recorded in the account of the "State-Wide First-Aid Contest in Illinois" in the issue of "Coal Age," June 12, 1915, on p. 1030.

The awards for the team events were as follows: First prize, silver cup, presented by the E. I. du Pont de Nemours Powder Co., American Mine Safety Association medals and $10 in cash; second prize, $10 in cash.

In one-man event: First prize, $3; second prize, $2. In two-man event: First prize, $5; second prize, $3. In three-man event: First prize, $7.50; second prize, $5. In four-man event: First prize, $15; second prize, $10.

In deciding the winners of prizes in the team events, the total number of points obtained by members of a team in all events was taken into account. The scores in the four-man events were added together, and prizes were awarded to the teams making the highest and second score thus figured.

FIRST-AID CONTESTANTS

Thirteen teams contested in the first-aid events, as compared with eight in the 1914 competition. These were: Clealum, No. 7 mine of the Northwestern Improvement Co.; Tono, Washington Union Coal Co.; Beekman, Roslyn Fuel Co.; Clealum mine, No. 2 team (N. W. I. Co.); Carbonado, Carbon Hill Coal Co.; Roslyn, No. 5 mine (N. W. I. Co.); Tono, Washington Union Coal Co. No. 2 team; Ravensdale mine (N. W. I. Co.); Roslyn, No. 6 mine (N. W. I. Co.); Black Diamond, Black Diamond First-Aid Association; Roslyn, Roslyn Fuel Co.; Roslyn No. 3 mine (N. W. I. Co.); Clealum, No. 7 mine No. 2 team (N. W. I. Co.).

In the first full-team event Clealum No. 7 mine took first place with 100 points, the Carbon Hill Coal Co.'s team from Carbonado came second with 97 points, while Clealum No. 7 mine No. 2 team was third with 96 points.

In the second full-team event Clealum No. 7 again led with 100 points, but Clealum No. 7 mine No. 2 team made 99 points, while the Carbon Hill Coal Co. scored only 89 points. Thus Clealum No. 7 easily won with 200 points, and No. 2 team of the same mine was second with 195 points, while the Carbon Hill Coal Co.'s team, which had started so well, was third with 186 points.

In the one-man event No. 2 team of the Washington Union Coal Co., the Roslyn Fuel Co.'s team and the Roslyn No. 3 team tied for first place, each obtaining 100 points. In a second contest the Roslyn Fuel Co.'s team received a perfect score, and the Washington Union Coal Co.'s squad was second with 89 points.

In the two-man event the three teams which tied in the one-man event tied again with the Roslyn No. 5 team. All received a perfect score. A second contest gave Roslyn No. 5 team first place with 97½ points and the Roslyn Fuel Co. team second place with 97 points.

RESCUE TEAM OF ROSLYN, NO. 6 MINE WHICH WON FIRST PRIZE FOR MINE-RESCUE WORK AT THE CLEALUM MEET OF JULY 31, 1915

From left to right—Tony Stanfel, captain; Tony Tomatich; J. E. Morgan, instructor; Matt Mohar; William Bedner, and J. M. Boose

WERE PHOTOGRAPHED WITH THE OFFICIALS OF THE COMPANIES INTERESTED

The three-man event was likewise hotly contested though more demerits were scored. Clealum mine No. 2 team received 100 points, but Clealum No. 7 mine, the Beekman team of the Roslyn Fuel Co., the Carbon Hill Coal Co. team, the Black Diamond First-Aid Association and Clealum No. 7 mine No. 2 team each obtained 98 points. A second trial of skill separated the five contestants, but still left two with 100 points—the Beekman team of the Roslyn Fuel Co. and team No. 2 of No. 7 mine, Clealum. These two had again to compete, and the latter won, securing 98 points, while the Beekman team received 5 demerits.

In the first four-man event the team from Clealum No. 7 mine, the Ravensdale team and that of Roslyn No. 6 each obtained 100 points. The Washington Union Coal Co. fell behind, receiving one demerit. Clealum No. 7 mine No. 2 team made only 98 points.

The second four-man event gave three teams a perfect score—the team of Clealum No. 7 mine and No. 2 team at Clealum and No. 2 team of Clealum No. 7 mine. The Washington Union Coal Co. No. 2 team received one demerit. As a result of the two four-man events Clealum No. 7 received a perfect score of 200 points, while the Washington Union Coal Co. No. 2 team tied with Clealum No. 7 mine No. 2 team, each having 198 points. Another contest had to be held, and in this the Washington Union Coal Co. team maintained its score at 198 points, but the Clealum No. 7 mine No. 2 fell back to 196½ points.

As Clealum No. 7 mine team of the North Western Improvement Co. obtained the highest aggregate in all events both this year and last, it was entitled to permanent possession of the silver cup, and the judges made the award accordingly. This team consists of the following members: William Saul, captain; Wilson Clarke, Joseph Parker, Henry Owens, Fred Ashurst and Joseph Andreotty, patient. The team receiving second prize, Clealum No. 7 mine No. 2 team, was composed of Frank Koester, captain, William Clarke, Joseph Hodgson, Isaac McGee, John Stofko and Rudolph Mayta, patient.

MINE-RESCUE CONTEST

The mine-rescue contest was held in the afternoon in the Ball Park, situated a short distance out of the town. A long covered gallery had been erected temporarily for the purpose of this contest and for demonstrating the effect of the use of certain explosives.

The contesting teams in this event each consisted of five men, including the captain. They were all equipped with artificial-breathing apparatus. The event as scheduled was as follows: A mine fire in a side entry is beyond control; the crew will enter and put up a temporary wooden stopping at the entrance. Just as the stopping has been completed, one of the helmeted men is found to have fallen in distress; he is carried to the front of the grandstand, a distance of 50 to 60 yd., and revived. Time, 25 min.

Discounts to be made in this contest were as follows:

Preliminary:	
1. High pulse, for each member	3
2. Failure to remain in smoke room, each member	4
3. Failure to name tests for apparatus, each test	5
4. Apparatus not properly adjusted to wearer	7
5. Loose joint or connection, each	12
6. Breathing bags, flat, each apparatus	8
While Performing Event:	
7. Failure to maintain 2-yd. interval advancing	2
8. Failure to test condition of roof	3
9. Failure to test for presence of gas	4
10. Failure of captain to give command	4
11. Failure of member of crew to obey command	5
12. For breathing external air intentionally	15
13. Failure to protect live men against mine gases	10
14. Failure to complete event in time specified	6
15. Failure to use life line in smoke	8
16. Losing time or doing unnecessary things	4
Total points	100

Seven teams took part in this contest: Carbon Hill Coal Co., Carbonado; Ravensdale mine, N. W. I. Co.; Clealum mine, N. W. I. Co.; Roslyn Fuel Co., Beekman; Roslyn No. 5 mine, N. W. I. Co.; Roslyn No. 6 mine, N. W. I. Co.; Washington Union Coal Co., Tono No. 2 team.

The rating of the prize-taking teams was: Roslyn No. 6 mine, first, with 95 per cent.; Washington Union Coal Co., second ($10 cash), with 84 per cent.; and No. 5, Roslyn No. 5 mine, third ($7.50 cash), with 83 per cent.

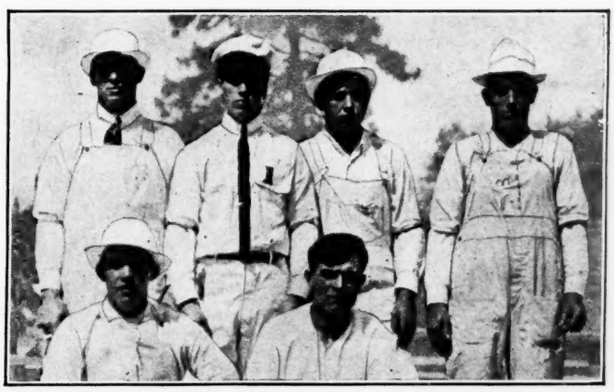
The first prize was a silver cup, donated by the E. I. du Pont de Nemours Powder Co., to be won two successive years by the same team, American Mine Safety Association medals and $10 cash. The winning team consisted of A. Stanfel, captain; J. M. Boose, William Bedner, A. Tomatich and W. Mohar. The members of the second-prize team were R. B. Ober, captain; John Ismay, Robert Wigley, Thomas Wigley and Thomas Kruger. The third-prize team included Walter A. Sneddon, captain; D. Shields, R. Lucas, J. Heathcock, Jr., and Luther Lloyd.

Dudley Michell, of Victoria, B. C., instructor in first-aid and mine-rescue work for the British Columbia Department of Mines, judged the contest and was assisted by H. M. Wolflin. John Parker, of Newcastle, rendered much service in expediting the work of the contest.

MINE EXPLOSION DEMONSTRATIONS

Demonstrations of the inflammability of coal dust were given during the afternoon, with the object of showing to miners and mining men generally how necessary it is to exercise care in placing holes and firing shots in mines, since a windy or blown-out shot is liable to cause an explosion that may result in the loss of many lives. The first demonstration was given by firing a charge of Monobel, a permitted explosive, into a dust-laden gallery, which did not cause an explosion. Afterward two other charges were fired into the same gallery, each charge consisting of one pound of black powder, and each caused an explosion followed by fire. The attendance at the Ball Park was larger than at the first-aid contests in the town, there having been between 2500 and 3000 people present to witness the mine-rescue event and the explosive-firing demonstration.

Among many others who attended and coöperated in making the meet a success were C. H. Younger, of Kirkland,



WINNERS OF FIRST PLACE IN FIRST-AID CONTEST FOR TWO CONSECUTIVE YEARS

Clealum No. 7 team of the Northwestern Improvement Co. Left to right: Back row—Wilson Clark; William Saul, captain, Fred Ashurst; Henry Owens. Front row—Joseph Parker; Joe Andreotty patient.

Wash., chief inspector, Department of State Factory Inspection; Clarence Parker, industrial insurance commissioner, and many coal-mine company managers and superintendents. The North Western Improvement Co. was represented by C. C. Anderson, Tacoma, general manager; Peter Bagley, superintendent of the company's Roslyn division; Arthur Hodder, superintendent of the Clealum division; J. D. Scott, superintendent of Ravensdale mine; J. E. Morgan, assistant superintendent of Roslyn and Clealum mines and in charge of first-aid and mine-rescue work. Other companies were represented as follows: Roslyn Fuel Co., by Charles E. Jones, general manager; Washington Union Coal Co., Tono, by E. S. Brooks, general superintendent; Osage Coal Co., Cumberland, by W. D. Williams, superintendent; National Coal Co., Cumberland, by Edwin Husband; Pacific Coast Coal Co., by Natt Moore, chief engineer, Seattle, and Ed. Bergen, mining engineer, Burnett; Roslyn Cascade Coal Co., by William Mackay, manager, and Roslyn Coal & Coke Co., by A. F. Plant, manager. E. Jacobs, of Victoria, secretary of the western branch of the Canadian Mining Institute, was one of the visitors from outside the state.

OUTPUT OF STATE IN 1914

As indicating the extent of the coal-mining operations of the State of Washington, the following summary for the year 1914 has been taken from the last published report of the state inspector, James Bagley:

The number of coal mines and openings of all kinds was 58. The total production of coal was 3,040,361 short tons; average value at mine, $2.35 a ton; total value, $7,142,084. The total production of coke was 78,573 tons; average value at ovens, $5.15 a ton; total value, $404,126. The total number of coal-mine employees was 5647—outside employees, 1264; inside employees, 4383. The average number of days operated was 206. The yearly production of coal per employee was 555 tons; the daily average per employee was 2.69 tons. The production of coal by counties was as follows: King, 1,042,607 tons; Kittitas, 1,237,564 tons; Lewis, 87,558 tons; Pierce, 553,841 tons; Thurston, 112,189 tons; Whatcom, 6602 tons. Coke was produced in Pierce County only, the total for the year being 78,573 tons.

Montana First-Aid Meet

By John L. Boardman*

SYNOPSIS—The Montana union miners exhibit their interest in the safety of their fellows and hold a most successful two-day meet at Billings, Mont.

The second Montana State-Wide First-Aid Meet was held at South Park, Billings, Mont., July 23 and 24, under the auspices of the Montana Coal Operators' Association, the United Mine Workers of America, district No. 27, the Anaconda Copper Mining Co., the United States Bureau of Mines and the American Mine Safety Association.

Teams were present from Klein, Roundup, the Anaconda Copper Mining Co.'s mine at Sand Coulee, Washoe, the Smith mine at Bear Creek, Red Lodge, the Smokeless and Sootless mine at Bear Creek, Stockett, the Boston & Montana Reduction Works at Great Falls, the Anaconda mine at Butte, the West Colusa mine at the same place, the Washoe Reduction Works at Anaconda and the Leonard mine at Butte.

MINERS UNION TAKES A LEADING PART

The judges, who were eight in number, were all medical practitioners. The committee of arrangements consisted of Henry Drennan, James Hunter and Robert Condon, president, vice-president and secretary-treasurer respectively, of district No. 27, United Mine Workers of America; W. D. Ryan, mine safety commissioner of the United States Bureau of Mines; C. W. Goodale, chairman, Bureau of Safety, Anaconda Copper Mining Co.; M. F. Purcell, secretary-treasurer, Montana Coal Operators' Association, and John L. Boardman, foreman of car No. 5, United States Bureau of Mines.

The teams from Lehigh and Carpenter Creek had been expected, but failed to attend. At 1 p.m., July 23, all teams and officials of the contest assembled at the Northern Hotel and embarked in automobiles furnished by the Billings Chamber of Commerce. The cars then lined up, and led by a band also furnished by the Chamber of Commerce, paraded to South Park, where they were unloaded and the field meet began at 1:45 p.m.

*Foreman car No. 5, United States Bureau of Mines.

The contest consisted of a one-man, a two-man, a three-man and a full-team event. In each the teams were required to work two problems, one each day, making eight in all. At 3 p.m. the teams had completed the first four problems and turned the field over to the mine-rescue demonstration.

AN EXPLOSION FOLLOWED BY A MINE FIRE

A representation of a mine had been built of 2x4's and tar paper, in which it was proposed to have an explosion and to rescue supposed victims. The explosion took place according to schedule, but on account of the extremely hot sun the flash of the black powder used in the demonstration set fire to the heated tar paper, and before the rescue crew could enter the tunnel the entire structure was in flames. The men who were to have acted as victims were obliged to escape through the sides of the mine before the rescue crew arrived. So from the viewpoint of the rescue crew the demonstration was more or less of a failure, but from that of the audience it was a spectacular success.

Immediately following the mine explosion an association football game was played between teams from Roundup and Klein, in which the Klein team won by a score of 3 to 1. The prize for this game was $100.

On the second day, July 24, the teams came to the grounds at 1 p.m., in automobiles, but without the parade, and immediately went to work on the other four problems.

LEONARD MINE OF BUTTE TAKES FIRST PLACE

The first prize, consisting of American Mine Safety Association silver contest medals and a silver loving cup donated by Dr. McDonald, of Stockett, was won by team No. 5 of the Leonard mine, Butte, but the A. M. S. A. medals were not received in time for presentation to the winning team. The members of this corps were as follows: George Ethier, captain; Homer Hagens, James McLeod, Saul Ryan, William Barraugh and Frank C. Deakin.

The second prize, consisting of American Mine Safety Association bronze contest medals and $75 cash, was won by team No. 9 of West Colusa Mine, Butte. These medals also failed to arrive in time. The members of the team were as follows: Frank Tanhauser, captain; R. Allen, James Blake, W. Lewin, W. Kelly and B. McDermott.

The third prize, consisting of $50 cash, was won by team No. 10 of the Washoe Reduction Works, Anaconda. This team was tied for third place by team No. 6 of Klein, but in working off the tie team No. 10 won third place. The fourth prize, consisting of $30 cash, was won by team No. 6 of Klein. The fifth prize, consisting of $20 cash, was awarded to team No. 8 of Tracey, Sand Coulee post office. The special prize of a silver loving cup presented by the Montana Coal Operators' Association and held for the past year by the Red Lodge team was won this year by team No. 10 of Anaconda for making the highest average in the team problems.

Promptly at 9 p.m. all members of the teams and the officials connected with the meet assembled at the Northern Hotel and seated themselves at a banquet. After coffee and cigars were served, and under the direction of W. D. Ryan, who presided, a number of officials and guests were called upon and responded with short talks on various subjects touching the work for the coming year. Prizes were presented by Robert Condon, secretary-treasurer, district No. 27, U. M. W. of A., and James Needham, general manager of the Republic Coal Co. A resolution was adopted regretting the untimely death of J. A. Holmes, former director of the United States Bureau of Mines, and commending his life of faithful service to the mining industry.

United First-Aid Corps Meet

By Lewis Richards*

The United First-Aid Corps of the Fourth District, Delaware, Lackawanna & Western R.R. Co. coal department, held a most successful first-aid contest at Harveys Lake, Penn., on Aug. 14. It is estimated that 8000 persons attended, 4000 of whom traveled on special excursion trains which consisted of six sections with 10 coaches to a section.

The contest was close, eight teams averaging between 99 and 100 per cent. Some of the work was declared by the judges to be so good that it could hardly be termed first aid.

Twenty-four teams entered the competition. The first prize of $75 was won by the Loomis inside team, which made a score of 100 per cent. This Loomis mine is owned by the D., L. & W. R.R. Co. coal department. The second prize was $50 and was awarded to the Harry E. colliery of the Temple Coal Co., which had a rating of 99.83 per cent. The third

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prize was won by the Baltimore shaft team of the Woodward colliery of the D., L. & W. R.R. Co. coal department, the rating being 99.66 per cent. The other scores were as follows: Pettebone mine (D., L. & W.), 99.5 per cent.; No. 9 breaker (Pennsylvania Coal Co.), 99.33 per cent.; No. 20 tunnel, Truesdale mines (D., L. & W.), 99.13 per cent.; No. 1 slope (D., L. & W.), 99 per cent.; Bliss mines (D., L. & W.), 99 per cent.; Woodward outside team (D., L. & W.), 99 per cent.; Central team from Scranton (D., L. & W.), 98.75 per cent.; Storrs No. 2 team from Scranton (D., L. & W.), 98.66 per cent.; Auchincloss mines (D., L. & W.), 98.33 per cent.; Loomis outside team (D., L. & W.), 98 per cent.; Plymouth Coal Co., 97.83 per cent.; No. 1 Red Ash, Woodward mines (D., L. & W.), 97.66 per cent.; Pine mine of Scranton (D., L. & W.), 97.66 per cent.; Avondale mine (D., L. & W.), 97.5 per cent.; Raub Coal Co., 97.08 per cent.; No. 17 slope, Woodward mine (D., L. & W.), 96.33 per cent.; Forty Fort Coal Co., 96.33 per cent.

In the boys' event only D., L. & W. boys took part. The Truesdale breaker boys made 99.83 per cent., receiving a prize of $10, and the Woodward breaker boys 99.33 per cent., being awarded the second prize of $5. The doorboys at the Woodward colliery made 96.17 per cent.

Troop I, Boy Scouts, of Kingston, was the only troop entered in the Boy Scouts' event. Though schools and churches were permitted to enter their juvenile members none took advantage of this opportunity. The Scouts made 100 per cent. and received a prize of $10. All the boys did excellent work. The Woodward boys had been organized only a short time. The Boy Scouts used improvised material, and their instructors are to be commended for the excellent showing made by the troop.

The president of the United First-Aid Corps of the Fourth District is John Thomas, foreman of the D., L. & W. R.R. Co. coal department mine rescue service. The vice-presidents are George Harlow, of the Woodward mines, and Henry H. Hitchins, inside foreman at Auchincloss colliery. The manager of the field was Charles Enzian, of the Bureau of Mines. The judges were Drs. D. G. Robinhold, Charles L. Shafer, J. A. Smurl, W. W. Waters, C. E. Bennett and J. H. Hughes The judges did not regard time as an element in determining the winners, the judgment being rendered wholly on the excellence of the work and not on the speed with which it was executed.

Compensation to Injured Men

In Colorado some miners are working who took part in the Balkan wars. Some of these have already lost a limb, and when the matter of insurance against accident arises, it is realized that the loss of another limb would result, not in mere reduction of earning power, but in complete incapacitation. As the law now stands, the company which employed such men would be obliged to pay as much as for the loss of two limbs, when only one was lost in the service of the company.

The companies are presenting this objection before the Industrial Relations Commission of Colorado and are seeking to have the law modified so that they will not be obliged to discriminate against those men who, being already afflicted, much need the work. Men who are not possessed of all their limbs and faculties are more liable to injuries than others, and it is not considered right that the company should pay the excess insurance rate which the hiring of such men involves.

Nor is it a desirable arrangement for the employees themselves; for it will inevitably result in the employer protecting himself by not hiring or by discontinuing the employment of crippled or otherwise abnormal men when such crippling or abnormality has not resulted from service to the company. In this way it will be hard for men of this kind to get work, as their labor is at once more hazardous and less effective.

The Victor-American Fuel Co., which presented the proposition to the commission, stated that it did not intend to discharge any of its men during the present biennial period; that it would assume the increased risk and increased insurance cost; but it requested the commission to arrange that the law be changed at the next session of the Legislature so that this trouble will not exist.

Safety Meets at the Panama-Pacific Exposition

In view of the great interest manifested by first-aid teams from mining colleges in the Third Annual Joint Field Meet to be held by the United States Bureau of Mines, the American Mine Safety Association and the California Metal Producers Association in San Francisco, Sept. 23 and 24, the rules committee has withdrawn the restrictions against such teams participating in the meet.

The ruling previously made that only teams from bona-fide mining, smelting and milling operations should be admitted to the interstate contests of Sept. 24, thereby restricting teams from mining colleges to participation in the demonstrations of Sept. 23, has been modified to provide that such teams and teams from state departments or other institutions interested in safety in mining, but not concerned in mine operation, may compete among themselves on the 24th for a special prize for the most proficient team from an educational institution.

It is hoped that a special prize or cup may be offered as an award to the team winning in this special competition. It is believed that this modification of the rules governing the meet will result in the sending of a large number of teams from the various colleges and universities in the West.

Americans Won't Work in Mines

About 50,000 of the 180,000 mine workers in the anthracite coal region of Pennsylvania are classed as "Americans," but this figure includes every employee born in this country, though many of their parents are foreign and do not speak a word of English. Mine superintendents in the region state that Americans would rather earn $1.50 a day at some "clean collar" occupation than twice as much in the mines. They attribute this to the false pride of the Americans, who have come to look down on manual labor.

"It takes more than one generation to make a miner," said an old Welsh foreman the other day, "and yet the second generation born in America invariably leaves the mines. The miners in the hard-coal districts of Pennsylvania are probably the cleanest laboring-men in the world. They take a thorough scrub every day, and when you see them downtown in the afternoon in their outdoor clothes you can't tell whether they work in the mines or in a store. But the American young man seems to imagine that some sort of social stigma attaches to the coal dust and the daily bath.

"Who are the men who dig your excavations and subways in the big cities? Italians, mostly. The Irish used to be willing to do it, but they no longer are. In the mines it is the Slavs that are doing the bulk of the work. Roughly speaking, we have, besides the 50,000 'Americans,' about 76,000 Slavs, 12,000 Italians, 11,500 Irish, 10,000 Austro-Hungarians, 6500 Welsh, 6000 Germans, 6000 English and 2000 men of other nationalities."

Discussion by Readers

Efficient Mine Foremen

Letter No. 1—I desire to offer the following remarks as showing what an efficient mine foreman can do in the way of maintaining good ventilation in a mine in his charge, and hope it will start a discussion of this question that may result in a very general improvement in conditions relating to good mine ventilation.

One occasionally visits a mine where his observations lead him to conclude that the foreman in charge either lacks the ability to apply practically what knowledge he has or that his store of resourcefulness is extremely limited. This is the case with many mine foremen when left to their own resources; they depend too much upon their assistants to carry on the actual work and give the necessary directions in the mine of which they are the nominal head.

Some time ago I visited a mine where I found the conditions, so far as ventilation was concerned, in a chronic state. Indeed, the air was so bad that it was not possible to see any distance ahead in the entries or rooms. There were 16 drivers hauling coal to a single sidetrack, and all of them were using oil lamps. As the amount of air traveling was insufficient to carry away even the smoke of the lamps, it may well be imagined what the condition was in the airways. One might suppose that the trouble was owing to the fan being too small for the ventilation of the mine or to the area of the airways being insufficient for the volume of air required. The fan, however, was sufficiently large and the area of the airways ample for a circulation four times the quantity of air necessary to ventilate the workings.

The trouble was not with the mine or its equipment so much as with the foreman in charge. This man spent most of his time on the tipple, where he could breathe freely, and the ventilation of the mine was left to take care of itself. Since the general enforcement of mine legislation tending to improve conditions in all mining districts, I have thought it impossible to find conditions in any mine as poor as they were here. Even the mules were unable to pull coal, although that was not necessary, as the miners could work only three or four hours each day. By that time, the smoke of the lamps and powder used in blasting had so filled the mine that the men were obliged to quit work and go home.

Compare these conditions with those that I am about to describe, which followed immediately on a change being made in the foremanship of the mine. The old foreman left and a new man was put in his place. According to all accounts, the new man has worked wonders in the mine. He has made it possible to get a full day's run each day. The miners put in a full day's work and the mules pull the coal without difficulty.

You ask, How did the foreman accomplish this change? I answer, It was very simple. The fan was capable of producing 65,000 cu.ft. of air per minute, although under the former management the circulation of air at the working face was only 15,000 cu.ft. per min. Under the old system, the mine was ventilated by a continuous current. The new man got to work promptly. He discovered that most of the stoppings or brattices were leaking badly. In fact, the wonder was that any air at all was able to reach the working face. He replaced the old stoppings of decayed brattice boards with substantial rock and cement. He split the air current in two places. Within a short time the conditions were so improved in the workings of the mine that it will be remembered by the men as long as they live.

A few days ago I met "Old Tom," who has worked in this mine for 15 years and is nearly done digging coal. Old Tom is 50 years of age and has what is called the "miner's asthma," as a result of the bad ventilation of the mine. He gasps as he talks. In reply to my inquiries as to his health, he said: "I'm feeling pretty good this morning (gasp); I'm a whole lot better than I was before this new man came here. Do you know (gasp) if that Jim Jones was still foreman in this mine, I would have been dead by this time. The new man sure knows his business (gasp). Where I used to load but two cars a day, I can now load four cars (gasp) and then walk out with only taking one rest, where I used to have to rest four times (gasp) before getting out of the mine. The new fellow sure is a fine man and knows his business."

Meeting the boss driver a little later, and remarking on the condition of the mules, he explained: "Yes sir, they are looking well and feeling good; but you should have seen them before the new man came. All of them were played out before noon, and many a time I have had to haul a mule out of the mine. They could not work long in that air, but it is all right now." It is wonderful what a little practical knowledge and good management can do in a mine.

These are but two simple illustrations of the grateful feeling that existed among the men for the accomplishment, by the new mine foreman, of what the company had always been paying for and expected was being done in this mine.

It is unfortunate that so many mine foremen, like many day workers, require watching. The great difference is, however, that a careless, indifferent mine foreman can and does cause incalculable harm, and endangers the life and health of every man in the mine to a far greater extent than is true of the ordinary mine worker.

WILLIAM CROOKS.

Kimberly, Ala.

Letter No. 2—The ventilation of a mine seriously affects every man that enters. Other features connected with mining, such as the hoisting of the coal, the method of working adopted, the drainage of the mine, etc., only

indirectly affect the mine employees. The ventilating current has been called very aptly, the "lifeline" of the mine.

While ventilation is the most important element in the mining of coal, it is strange to observe how little attention is given to the matter as a rule, except in cases where the mine is particularly gaseous and its efficient ventilation becomes a necessity.

Every "mine manager" as the mine foreman is called in Illinois, is supposed to know the theory of ventilation as applied to mining. But how often it happens that the foreman in charge of a mine is ignorant or inefficient, and as a result the working places are badly ventilated. Too often the main object in view is to obtain cheap coal and reduce the cost of production to the lowest possible point, and in doing this the foreman is constantly striving to beat his own previous record. Cheap coal is all right when its production does not interfere with or prevent the systematic work of mining and the maintenance of safe and sanitary conditions in the workings.

It is generally remarked that the majority of mine accidents are owing to carelessness. As a matter of fact, however, many of these accidents can be traced to the inefficient ventilation of the mine. They are too often the result of breathing air that is largely depleted of its oxygen and highly charged with deleterious gases, which cause languor in the workmen and induce carelessness. In this condition, it cannot be denied that many employees take chances that they would not take otherwise. Aside from this, there are other reasons why every mine should be well ventilated. The breathing of good air goes far toward reducing feelings of dissatisfaction on the part of the worker—the grouch is taken out of the man, and he feels better.

Now observe for a moment the effect produced sooner or later as the result of inefficiency on the part of the foreman in charge of a newly opened mine. At first there is an abundant supply of air, and it is perhaps necessary to leave two or more crosscuts open near the face so as to reduce the force of the air current, in driving narrow work. Later, if the foreman is inefficient and does not carefully supervise the work of building the stoppings, they soon develop leaks, with the result that the supply of air at the working face grows constantly less.

When a mine is developed under these conditions, it is only a question of time when the air supply at the face will be insufficient, and it will be necessary to repair the stoppings, which is often done at great expense; because in many cases the rails have been removed and it is difficult to get the necessary material to hand for building the stoppings and making them air-tight. As a result, much patchwork is done, both on doors and stoppings, and still the air supply will often be found insufficient, and it becomes necessary to shorten the distance of air travel by opening temporary airways or crosscuts through abandoned workings.

In most cases splitting the air current has been carried to the limit, and frequently the only recourse that remains is to sink a new air shaft, enlarge the airways, or install a booster fan at some point in the mine. Sinking an air shaft is often impracticable, while enlarging the sectional area of the airways for thousands of feet is generally prohibitive of that method also.

Under these conditions, the installation of a booster fan is resorted to by a foreman who has neglected to carefully consider the question of the future ventilation of his mine when the work of development was in progress. The booster fan is generally operated by electric power. Speaking of boosters, it must be remembered that in many cases such a fan accomplishes only the churning of the mine air. However, impure air in motion is better than stagnant air, and some good is accomplished even then.

The question that presents itself to the thoughtful man is, Why should any mine be brought to such a condition that it cannot be ventilated by the main fan at the surface? In the development of a large territory, ample preparation should be made at the start to furnish the maximum circulation required in the future development of the mine. The proposed plan and output of the mine should be determined and the necessary equipment provided. In the development of the mine, an efficient mine manager (foreman) will build good stoppings as the work proceeds, employing men for that purpose who understand what is necessary to be done. As far as practicable the same men should continue to do the same work from day to day. The practice of having some men build stoppings one day and of employing others to do the work the next day should not be tolerated, but the men engaged in this work should be responsible for the results.

Under a shale or slate roof an efficient foreman will often keep a track in both entries or airways, for the purpose of cleaning up falls that constantly occur. It will frequently prove good practice to arrange to take the empties in on one entry while the loads are hauled out on the other, and this will not only insure that both entries are kept in good condition, but will also greatly facilitate the ventilation of the workings when extended. In all these arrangements, the future working of the mine must be kept continually in mind. It is important to remember that it is not sufficient to provide a ventilating fan that is guaranteed to produce a given quantity of air at a certain speed, when no attention is given to the conditions underground. The airways must be kept open and unobstructed in order that the fan can do its work.

The question is often asked, Why is it that so large a number of mines have a good supply of air at the shaft bottom and on the main airways, while the working faces are so poorly ventilated? In answer to this question, it may be stated that the mining laws are often to blame for such a condition. In most coal-mining states, the law requires a specified volume of air to be circulated in the mine. This volume is usually 100 cu.ft. per man per minute, and 500 cu.ft. per animal employed in the mine. In most cases, the law fails to state where this volume of air should be measured, and as a natural result the measurement is taken at the foot of the intake or downcast shaft.

The bituminous mine law of Pennsylvania (1911) requires the mine foreman to measure the air once every week at or near the main inlet and outlet airways in the mine and also at the last cut-through in the last room and in the entry beyond the last room (art. 9, sec. 4). The Illinois mine law requires the air to be measured at the foot of the downcast and the upcast and provides further that doors, curtains or brattices shall be placed

for conducting the required amount of air into the working places. The law leaves, however, much to the judgment of the mine inspector, and here there is room for argument, since one inspector may differ in his judgement from another. In my opinion, the inspector should be required to enforce laws and not obliged to make them. The making of the laws can only be intrusted safely to the representatives of the people appointed for that specific purpose.

It is true that the Illinois law requires the "mine examiner" (fireboss) to measure with an anemometer the amount of air passing in the last crosscut or breakthrough of each pair of entries, or in the last room of each division in longwall mines, and at all other points where he may deem it necessary, and to note the results of such measurements in the mine examiner's book kept for that purpose. But suppose he does not get a reading; he either reports "no reading," or he makes no entry in the book for that place. The state mine inspector is supposed to examine these reports. To secure good ventilation in all mines, however, at the working face, a law is required that will provide a certain definite quantity of air in circulation at the inby crosscut on each pair of entries and in the last breakthrough in each room, similar to the requirement of the Pennsylvania law.

W. L. Morgan.

East St. Louis, Ill.

Preventing Mine Explosions

Letter No. 7—In his letter No. 5, *Coal Age,* Aug. 14, p. 268, John Rose asks if the suggestions made in previous letters on this subject are strictly followed, will they "eliminate such explosions?" To this question, I answer "Yes," but they must be strictly followed.

I believe every recent explosion has been the result of someone in some way slipping a cog; that is to say, overlooking or neglecting some precaution that every one connected with the mine should observe. Some place has been allowed to become dusty; some shot was improperly prepared, or overloaded, or tamped with coal dust; or mixed explosives were used; or the ventilation has been permitted to become disarranged and to remain so till sufficient explosive gas has accumulated to cause an explosion; or something has been allowed to happen that should have been prevented.

The old adage is, "Accidents will occur in the best regulated families," but I believe that by eternal vigilance they can be reduced to a minimum.

I think that William Crooks, in his letter No. 3, July 24, p. 143, struck the keynote of the whole situation when he said: "In my opinion, the true solution of this question lies in a higher sense of duty among mining officials and a more thorough and intimate knowledge of the elementary principles of mining by the rank and file of mine operatives. Attention has well been drawn to the great need of education of mining men and of coöperation on the part of every mine worker and mine official," and adds, "As long as mines are operated in a careless and inefficient manner disasters are liable to happen at any time."

In regard to the question of strong air currents, I am not an advocate of excessive air currents. I believe that after introducing enough air into the mine to comply with the law and to so dilute as to render harmless the various mine gases, there is nothing to be gained by a further addition of air, which might increase the danger. The more air that is circulated through the mine the more moisture is carried out and the more difficult becomes the thorough humidifying of the air and prevention of dust. Also, a high air velocity keeps more dust in suspension and tends to pick up dust from the loaded cars on haulage roads and carries it in suspension or deposits it on timbers, ribs and gobs. Also, the more air supplied, the more oxygen there is present to help feed an explosion if one should occur.

I do not want the foregoing to be construed as advocating insufficient ventilation. On the contrary, I am a strong advocate of ample ventilation, but like all good things there can be too much of it.

In regard to the last two paragraphs of Mr. Rose's Letter No. 5, it must be remembered that the most efficient and competent man is apt, at some time, to have someone under him err, and I venture the assertion that, even if a human factor is not discovered in the cause for any particular explosion, it is there just the same.

Edw. H. Coxe.

Knoxville, Tenn.

Mining Laws and Legislation

Letter No. 10—In his letter No. 8, *Coal Age,* Aug. 21, p. 309, Mr. Hogarth has cited a portion of the law, art. 4, sec. 24, which he assumes I have either overlooked or disregarded in discussing the responsibility of the assistant mine foreman, and which he considers the final affirmative answer as to the said responsibility.

Instead of regarding this section as being clear, concise and final in this respect, from its phraseology and construction, I consider it, if not decidly equivocal, at least capable of a double meaning. I believe that its real intent and application cannot be determined without reference to previous portions of the same article.

When taken alone it must be admitted that this section is capable of being understood to mean that the assistant, as such, is amenable to the same penalties for the violation of any of the requirements of the act as the mine foreman, or it may be taken to mean that when the assistant is performing the duties of the foreman, during the latter's necessary temporary absence, he is then, to all intents and purposes of the law, a mine foreman, and as such is held responsible. Both of these constructions cannot be true, however, since if they were, the assistant would be equally responsible with the mine foreman, under all circumstances, and could not therefore be expected to comply with the instructions of the foreman in respect to carrying out the provisions of the act.

Sec. 1 of art. 4 stipulates, first, that "the mine foreman shall have full charge of all the inside workings and of the persons employed therein, in order that all the provisions of this act, so far as they relate to his duties, shall be complied with," and, second, that the assistants "shall act under his [mine foreman's] instructions in carrying out the provisions of this act."

These two provisions, to my mind, establish the preeminence of the foreman both as to his authority and responsibility, and may be logically regarded as emphatically and unequivocally referring all subsequent requirements of the act to his supervision and execution, either personally or by proxy.

In his interpretation of sec. 24, Mr. Hogarth has evidently understood the first construction I mentioned previously and by so doing has overlooked the more comprehensive stipulations of the first portion of the article. In the interpretation and application of a law, the intention of its requirements must be kept in view, and where the phraseology of any particular portion would make that intent obscure or uncertain, its meaning must be derived from those parts that are clear and emphatic. There is neither obscurity nor equivocacy, in the first section of the article, in regard to the authority of the foreman nor in reference to the subordination of the assistant. Bearing this relation to each other under the law, it would be inconsistent with the law's intent to contend they are equally responsible under the act, or to attempt to destroy the meaning and application of one portion by arraying against it another portion of such grammatical construction as to be capable of a misapplication in the practical operation of mines.

It is neither my desire nor intention to engage in a discussion that is of little practical value, but I regard it as the duty of every man in the name of justice to protest against an evident misinterpretation of a law. I have found nothing in the bituminous mine law (1911) that can be construed to make the assistant mine foreman any more or less than a representative of the foreman, and in this respect he occupies the same relative position as the representative of a constituency. In the discharge of his duties, he loses his individuality and becomes the embodiment of another whose will and pleasure he carries out. Therefore, I claim that the acts of the assistant are the acts of the foreman and the assistant cannot be held responsible for another's acts.

In the extract given from art. 19, sec. 13, the important point is to interpret correctly the meaning of the words, "the person or persons at fault." I would like to ask, Would it be just to place the fault on an individual who is acting in an official capacity under the instructions of another? The attempt has been made, both by mine inspectors and foremen, to hold the assistant foremen responsible, and this fear has been held, unlawfully, over the heads of the assistants, thus affording greater facilities for shifting the blame from the legally responsible party.

It would be interesting, in connection with this discussion, to read the decision of Judge W. H. Ruppel in the case of Joseph Willis vs. Commonwealth of Pennsylvania, and to note that in that decision the mine foreman is named as the official to see to the execution of the law, the assistant being referred to only as a delegated authority to carry out his orders.

I. C. PARFITT.

Jerome, Penn.

Study Course in Coal Mining

BY J. T. BEARD

The Coal Age Pocket Book

THEORETICAL CONSIDERATIONS IN SPLITTING

Theory assumes that when an air current traveling in an airway divides, at a certain point called the "point of split," into two separate currents or "splits," the unit pressure (p) at the point of split is common to each split. In other words, two splits starting from the same point in a mine have the same unit pressure (p) and, for the same sectional area (a), the resistance ($R = pa$) is the same for each split. The same holds true for any number of splits (n) of equal area.

Whether the unit pressure (p) or the unit work (pv) is the factor common to each of two or more splits starting from the same point will not be discussed here. The law of dynamic equilibrium of fluids points to the equality of unit work for each split. The comparison of the relation of the quantity of air (q), the rubbing surface (s) and the sectional area (a), on these two basis of reasoning, is as follows:

Unit Pressure	Unit Work
$p = \frac{ksq^2}{a^3}$	$\frac{u}{a} = \frac{ksq^2}{a^4}$
For constant unit pressure:	For constant unit work:
$q \text{ varies as } a\sqrt{\frac{a}{s}}$	$q \text{ varies as } a\sqrt[3]{\frac{a}{s}}$

Practical Conditions—In considering the practical results of splittng the air current in a mine, it may be assumed that the power on the air (U) at the mouth (intake) of the mine remains constant. Assuming a number of splits (n), starting from the same point in the mine, the total area of passage is na and the formula for power is then

$$U = \frac{ksQ^3}{(na)^3}$$

which shows that, since in any case U, k, s and a are each constant, Q^3 varies as n^3, or Q varies as n, which is the number of equal splits, each having an area a.

In other words, the quantity of air circulated in a given mine, by a given power on the air (effective power), is proportional to the number of splits, assuming the splits all start from the mine entrance or so near to it that the resistance of the main intake entry, slope or shaft may be ignored. Under these conditions, splitting the air has no effect to alter the velocity or the resistance in the mine.

When the point of split, however, is some distance inby from the mouth of the mine or "daylight" the effect of splitting the air, in that case, is to cause a disproportion. The quantity of air circulated by a given power no longer varies as the number of splits; but the ratio of increase in volume is less, because the power on the air at the mouth of the splits is decreased by splitting.

Assuming, as before, a constant power on the air at the mouth of the mine, since the quantity has been increased by splitting, both the velocity and resistance have been increased in the main airway, which absorbs more power thus decreasing the power on the splits.

The Coal Age Pocket Book

Effect of Splitting on Velocity—In order to show the general effect of splitting the air current, at any point in a mine, on the velocity (v_0) in the shaft or main airway and the velocity (v_1) in the splits, it is necessary to know the ratio (m) of the rubbing surface (s_1) in the splits, to that (s_0) in the shaft or main airway; also, the ratio (n) of the area (a_1) of the splits, to that (a_0) of the shaft or main airway.

Then, $$s_1 = ms_0; \quad \text{and } a_1 = na_0; \tag{1}$$

and, since for a given quantity the velocity varies inversely as the area,

$$v_1 = \frac{v_0}{n} \tag{2}$$

But, the power on the air (U) at the mouth of the mine is equal to the power (u_0) absorbed in the shaft or main airway, or both, plus the power (u_1) absorbed in the splits.

$$U = u_0 + u_1 \tag{3}$$

or, expresed in terms of the mine, since $u = ksv^3$,

$$U = k(s_0v_0^3 + s_1v_1^3) \tag{4}$$

Substituting for s_1 and v_1^3 the values given in equations 1 and 2, gives after simplifying

$$U = ks_0v_0^3\left(1 + \frac{m}{n^3}\right) = ks_0v_0^3\left(\frac{n^3 + m}{n^3}\right) \tag{5}$$

Equation 5 shows clearly that, for a constant power on the air at the mouth of a mine, in splitting,

$$v_0 \text{ varies as } \frac{n}{\sqrt[3]{n^3 + m}} \tag{6}$$

and, observing equation 2,

$$v_1 \text{ varies as } \frac{1}{\sqrt[3]{n^3 + m}} \tag{7}$$

It appears from the last three equations that as the ratio of the split area to the shaft or main-intake area, represented by n, is increased the main-intake velocity (v_0) is increased, while the split velocity (v_1) is decreased, the increase and decrease of velocity, however, being less rapid than the change in the area ratio.

Effect of Spliting on Quantity—The quantity of air in circulation varies directly as the intake velocity v_0; or, for a constant power (U) on the air,

$$Q \text{ varies as } \frac{n}{\sqrt[3]{n^3 + m}} \tag{8}$$

Effect of Splitting on the Mine Resistance—The total mine resistanec is the sum of the main-intake and split resistances.

Thus, $$R = k(s_0v_0^2 + s_1v_1^2) \tag{9}$$

and $$R = ks_0v_0^2\left(\frac{n^2 + m}{n^2}\right) \tag{10}$$

Finally, from equations 6 and 10 is derived

$$R \text{ varies as } \frac{n^2 + m}{\sqrt[3]{(n^3 + m)^2}} \tag{11}$$

Inquiries of General Interest

Efficiency of Mine Fans

Will you kindly explain why there is such a great difference in the observed efficiencies of ventilating fans in mining practice. The initial depression, for any tip speed u, as expressed in inches of water gage, is commonly calculated by the formula

$$w.g. = \frac{1.2 \times 12}{1000} \times \frac{u^2}{g}$$

I have observed that the use of this formula gives widely different results in fans of the same size and operated at the same speed. How should the efficiency of these fans be calculated for comparison.

MINING ENGINEER.

Chicago, Ill.

There are two methods of estimating efficiency that have been more or less prevalent in fan practice. The earlier practice was to estimate the efficiency as the ratio of the actual gage in the fan drift to the theoretical gage as calculated by the formula given by correspondent, reducing this ratio to percentage by multiplying by 100. Later practice, however, quite generally bases the efficiency of a ventilator on the ratio of the power on the air, as measured in the fan drift, to the indicated horsepower of the engine driving the fan, as calculated from the indicator card.

In regard to the first method mentioned, it has been generally recognized that the water gage developed by the operation of the fan is not a true factor of the fan itself, since it is modified—indeed, we may say established, by the resistance of the mine against which a given fan driven at a given speed will produce a volume of air that will be greater or less according as the resisting pressure is less or greater. In other words, the action of the fan must be measured by both the volume and the pressure, since the one increases as the other decreases, for the same speed of the fan. It is evident, therefore, that the same operation of the fan may develop a higher or a lower pressure, depending on the resisting power of the mine or airway, which obstructs the flow of the air current, both in the mine and through the fan. This conclusion shows that the "manometric efficiency" permits of a true comparison of fans only when operating against the same mine resistance, and this explains in part the wide difference in the efficiencies of like fans operated at a like speed, but under different conditions.

In this connection there is another important consideration affecting the efficiency of centrifugal ventilators. For example, when a fan is operated against a less resistance than that for which it was designed, a heavy burden is thrown on the fan by reason of the increased quantity of air that rushes through it as a result of the low resistance against which the fan is working. Assuming that the total power operating the fan is unchanged, a larger proportion of this power is then absorbed in the fan itself and a less proportion of the power is effective in the mine, and the efficiency, which is the ratio of the effective power to the total power producing circulation, is rapidly decreased. Calling the efficiency K, if a total power U produces a quantity of air Q against a unit pressure p, we have

$$U = \frac{Qp}{K}$$

Now, practically, the power required to turn the fan varies as its speed of rotation, or the number (n) of revolutions per minute; and it has been too generally assumed that the quantity of air in circulation varies as the speed of the fan. This would be true if the pressure p varied as the efficiency K, which is not the case. A large number of experiments show that the efficiency varies as the $\frac{7}{8}$ power of the pressure against which the fan operates. Then, since the pressure varies as the square of the quantity of air in circulation, it follows that the speed of rotation varies as the $\frac{5}{4}$ power of the quantity of air in circulation, or the fourth power of the speed varies as the fifth power of the quantity.

The practical conclusion to be drawn from the relation thus found to exist between the power, speed and efficiency of the fan and the quantity and pressure of air in circulation is shown as follows: Assuming a constant power applied to the fan shaft, resulting in a practically constant speed of the fan,

$$Q \text{ varies as } \frac{K}{p}$$

Any change in ventilating pressure, owing to a change in the mine resistance, is accompanied by a similar though less rapid change in the efficiency of the fan. Consequently, there is always a loss of efficiency when a centrifugal ventilator is operated at a lower pressure than that for which it is designed; and, *vice versa,* there is always a gain in efficiency when a fan is operated at a higher pressure than that for which it is designed. These remarks refer to changes occurring in the mine or airway, with a constant power applied to the fan shaft.

On the other hand, assuming the conditions in the mine or airway remain unchanged, any increase or decrease in the power applied to the fan shaft is accompanied by a nearly proportionate increase or decrease in the speed of the fan, resulting in a similar, but not proportionate, change in the quantity and pressure of the air in circulation. In this case, since, practically,

$$K \text{ varies as } \frac{Qp}{n}$$

it follows if p varies as Q^2, and Q varies as the $\frac{4}{5}$ power of n, the efficiency varies as the $\frac{7}{5}$ power of the speed, or the fifth power of the efficiency varies as the seventh power of the speed. This shows that there is a gain in efficiency when a fan is operated at a greater speed than that for which it is designed, assuming the conditions in the mine remain unchanged. Likewise, there is a loss in efficiency when the fan is operated at a less speed than what that for which it is designed.

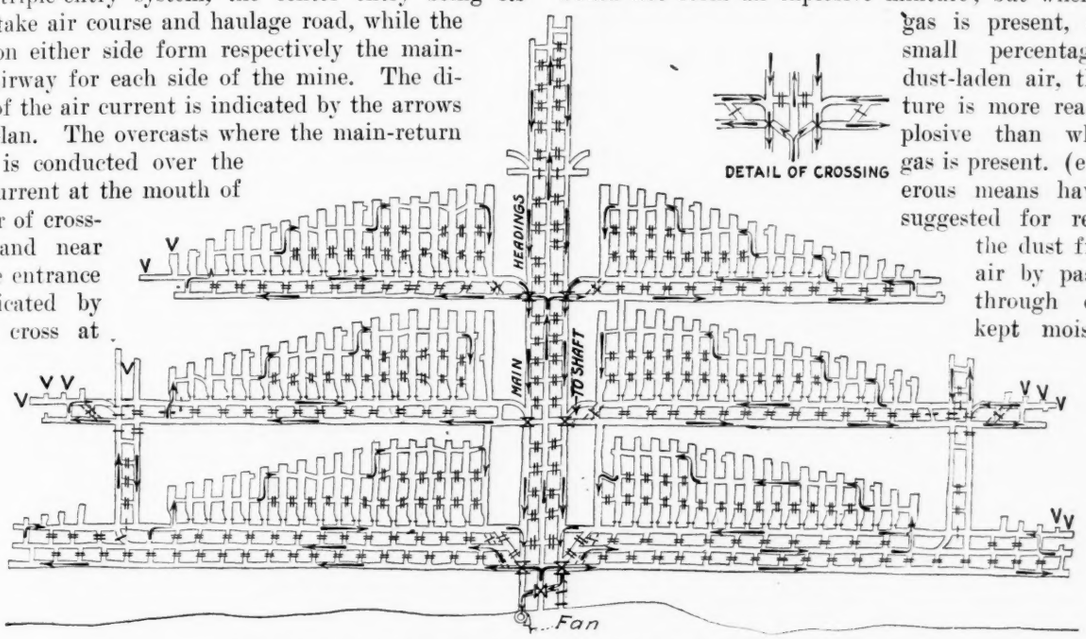
Examination Questions

Some West Virginia Questions

(Answered by Request)

Ques.—Show on the accompanying plan where the fan should be located and indicate the proper method of ventilation by means of arrows, showing the position of overcasts, doors, stoppings and regulators by means of the usual symbols. Note any violation of the mine law by the letter *V* on the plan.

Ans.—So many requests have been received relating to this question that we reproduce the plan of mine published in a former issue of *Coal Age*. The letter *V* indicates where rooms have been turned inside of crosscuts or where headings have been driven a greater distance than the 80 ft. specified in the mine law. The location of the fan is as indicated. This mine is opened on the triple-entry system, the center entry being its main intake air course and haulage road, while the entries on either side form respectively the main-return airway for each side of the mine. The direction of the air current is indicated by the arrows on the plan. The overcasts where the main-return current is conducted over the intake current at the mouth of each pair of cross-entries and near the mine entrance are indicated by a large cross at those points. Stoppings are indicated by a double line and doors by a single line crossing the heading or passageway, while regulators are indicated by a broken line across the heading. The general arrangement of the air crossings is shown in detail just above and at the right of the general plan.



SHOWING DEVELOPMENT OF A WEST VIRGINIA MINE

Ques.—(a) Is coal dust explosive? (b) If so, where are explosions of coal dust most likely to occur? (c) What weight of dust in air makes an explosive mixture? (d) What weight of dust and what percentage of marsh gas will make an explosive mixture? (e) What means have been proposed to remove coal dust from the air? (f) What method has been found most successful for purging the air of coal dust? (g) Is it best to prevent the suspension of coal dust in air or to remove the dust after it has been suspended?

Ans.—(a) Yes, under favorable conditions. (b) Coal-dust explosions are most likely to occur in dry and dusty mines, especially where a small percentage of marsh gas is present and where black powder is used for blasting the coal and suitable precautions are not taken to avoid excessive charges of powder and badly located shots.

(c) The weight of dust required to form an explosive mixture in air free from gas depends, to a large extent, on the inflammability and fineness of the dust. Experiments performed at Pittsburgh on fine bituminous dust that has been passed through a 200-mesh sieve produced explosions when the density of the dust-laden air was 1 lb. of dust per 500 cu.ft. of air, while other experiments at Liévin, France, showed explosions to take place when there was 1 lb. of dust to 230 cu.ft. of air.

(d) Marsh gas and dust without the addition of air would not form an explosive mixture; but when marsh gas is present, even in small percentages, in dust-laden air, the mixture is more readily explosive than when no gas is present. (e) Numerous means have been suggested for removing the dust from the air by passing it through curtains kept moist with water, or by sprays of water thrown across the entry through which the air is passing; also, by alternating the width of the airway, so as to cause a reduction of velocity at intervals where the dust would fall.

(f) The most effective means of purging the air from dust is to prevent its being thrown into suspension in the air current, by avoiding the accumulation of dust at the working face and the use of heavy charges in blasting. All fine coal and dust should be loaded out of the mine in dustproof cars, and the working face should be thoroughly watered before firing shots.

(g) Since an ounce of prevention is worth a pound of cure, it is better to use every precaution to prevent the suspension of dust in mine air, but means must also be adopted for the removal of dust that it is impossible to prevent getting into the air.

Coal and Coke News

Washington, D. C.

Sufficient time has now elapsed since the handing down of the decision of the Interstate Commerce Commission in the anthracite cases to permit the expression of some more definite opinions regarding it both by coal and railroad interests. Taken in conjunction with the decision in the matter of rates governing the transportation of railroad fuel and that regarding the rates to be charged for commodities generally by the Western roads, this opinion is regarded by competent students as the most important act of the commission for a long time in determining the relations between the carriers and the coal companies.

It is of course generally admitted that the significance of the decision is quite materially diminished by the fact that there is such an intimate relationship between the carriers and the producing mines in the anthracite region. That being the case, the decision is not regarded as of direct and fundamental importance to consumers or even, in the main, to miners as such, because of the almost complete identity between the anthracite roads and the coal-mining companies.

Should the commodities clause be so applied as to bring about a real separation between the mines and the carriers the effect of the anthracite decision will be considerably more practical and more marked. It will then be apparent what the result of a reduction in the charge for transportation will be in affecting the price of coal to the consumer. Meantime, it is noted that the commission itself seems to concede in the opinion that the verdict is of chief practcal importance to the producers of about 20 per cent. of the anthracite output who are supposed to be "independent."

The essence of the decision in the anthracite case is seen in the methods it employs for the determination of a reasonable rate for the carriage of freight. With due limitation it is assumed throughout the opinion that the coal furnishes practically the staple busines of the anthracite roads (a tabular view shows that it runs to one-half or more of all freight), so that in speaking of income from the transportation of coal reference is made to (substantially) the chief income of the carriers.

The Inherent Unlawfulness of Rates

The point of the opinion is then seen in the statement that ". . . We are impressed with the inherent unlawfulness of the rates and practices established by these carriers, which clearly are the outgrowth of past conditions wherein the carriers were producers, shippers, transporters and vendors of the commodity. If the rates they established for transportation were excessive it resulted in no hardship to their mining and selling operations because the excessive profits from the transportation services offset the absence of profit in their mining and selling operations. And high rates eliminated the competing shipper from the markets."

This conclusion is arrived at after an analysis of the conditions of capitalization and operation of each of the carriers involved, with remarks regarding the relations between each carrier and the coal-mining industry along the route or as controlled by the carrier in question. A curious feature of the decision is found in the fact that despite this criticism of the methods pursued in the past when the operations of mining and transporting were admittedly in the same hands. The commission goes on to say that the coal companies now controlled by the carriers "ship 80 per cent. of the total production, and if a substantial reduction is made in the tariff rates its full effect will fall upon but 20 per cent. of the tonnage shipped"—a remark which appears to imply that, in spite of all that has been attempted to the contrary, the same kind of control that has prevailed in the past will be expected to continue in the future.

Financially the exact effect of the decision is considered not easy to trace. The reductions ordered range from 15 to 50c. per ton, but without knowing the tonnage moving to various points at each of the newly fixed rates, an exact computation of the resultant loss of income is out of the question. Possibly the most significant financial aspect of the opinion is found in the computation of cost of transportation on anthracite coal per ton of 2000 lb. per mile as 3.3 mills, while average revnue on the coal roads is given as follows:

	Average Haul	Average Revenue per Ton Mile
Central R.R. Co. of New Jersey...	140.58 miles	9.45 mills
Lehigh Valley R.R. Co.....	157 miles	9.44 mills
New York, Ontario & West. Ry. Co.	209 miles	6.18 mills
Erie R.R. Co.....	169.90 miles	7.39 mills
Philadelphia & Reading Ry. Co...	185.70 miles	6.44 mills
Delaware, Lack. & West. R.R. Co.	147 miles	7.90 mills
Pennsylvania R.R. Co.....	221.43 miles	5.43 mills

Deducting the stated cost of transportation 3.3 mills per mile from the figures in the last column shows an alleged "margin of profit on tidewater anthracite" varying from something over 2.1 mills to something over 6.1 mills per ton-mile. It seems plain that the cut of 15 to 50c. per ton, equal perhaps to an average cut of 10 to 15 per cent. in haulage charges, is not expected to materially affect the revenues thought by the commission to be realized at present even if there should be no growth in density of traffic as a result of the reduction.

In some respects the most interesting phase of the opinion is thought to be seen in the remarks of the commission regarding the "practices" of the coal roads. Several of them are said to be still practicing what amounts to discrimination by granting the exclusive use of some of their p'ers, docks, storage plants, retail delivery trestles and other properties to their allied coal companies at inadequate rental charges and under conditions which constitute substantial discrimination in favor of such coal shippers, while several are alleged to have declined to establish joint rates for all shippers notwithstanding the coal output of their allied companies has been accorded an interline movement by means of trackage arrangements and the free transportation to junction points of the coal production exchanged by the coal companies controlled by the carriers.

Such practices are criticized as unlawful and discriminatory in the worst sense, since the discriminaton results to the benefit of the carriers. On the whole the action of the commission in ordering the abolition of these practices and the establishment of through routes and joint rates is thought by many to be the most decided feature of the opinion, if they should, as the commission predicts, have the effect to "neutralize any . . . undue benefit heretofore enjoyed by the coal operations of railroad ownership."

The Railway Fuel-Coal Decision

Considerable interest is likewise expressed in the decision of the commission regarding the practices governing the transportation of fuel-coal for railways rendered at about the same time as the general anthracite decision. This case, it will be recalled, was instituted because the commission's attention had been directed at various times to the method of handling railroad fuel-coal in vogue in Southeastern territory.

The fuel-coal in question, as is now brought out, is purchased f.o.b. the mines, and the factors taken into consideration in letting the contracts were (1) the price of coal at the mine mouth, (2) the division of the joint through rate which issued to the originating carrier, and (3) the cost of transporting the coal from the junction points to the points of consumption.

After considering the evidence in the case the commission reaches the conclusion that "one of the determining features if not the controlling one is the divsion of the joint through rates which must be paid to the originating carriers." The commission adds that "in order to intelligently bid for the coal contract it is necessary that the competing operators shall know definitely the amount of this division. While in ordinary commercial business the through rate to be paid for transportation is the important factor, here the essential factor is the division of the through rate paid up to the junction. For this reason all the facts and circumstances which make it desirable that the exact rate of transportation on commercial shipments shall be published make it desirable that the divisions of the rates under which railway fuel coal is transported be published."

On the strength of this reasoning the commission announced a determination to treat the railway fuel-coal like other coal moving over the lines. From this it follows that a railroad company when acting as shipper is entitled to the same consideration as a commercial shipper, and no more, even when the shipment moves in part over the rails of such a company.

In such cases the carrier is held to be entitled to a division of the joint through rate, such rate, however, having been fixed by the same considerations which would determine divisions upon a through commercial shipment in which the railroad had no interest other than that of carrier. For the future the divisions of rates in the case of fuel-coal over the roads involved in the controversy or inquiry are to be fixed by the commission and to be filed with it as in the case of other rates.

HARRISBURG, PENN.

The fifth annual reports of the Mining Institutes in the anthracite region, which are conducting mining schools at night, under the direct control of the public school boards have just been completed by the presidents and secretaries of these Mining Institutes, and have been compiled and arranged in a comprehensive and combined report by Charles K. Gloman, chief clerk of the Susquehanna Coal Co., Wilkes-Barre. This report has been made public by the companies which have taken an especial interest in this work.

This is the second season of direct control by the public school boards and of direct coöperation by the State Department of Public Instruction, with the continued moral and financial support of the operating coal companies, the wisdom of this method of control has been amply proved.

With advisory committees representing both the employers and employees to coöperate with the public school authorities the three elements are united which assures the present and future success of the schools. The needs of the employee and the needs of the employer are thus combined with the knowledge and experience of the educational experts. The best proof of the success of this combination is that 11 of the students passed the state examinations for mine foremen and 44 students passed the state examinations for assistant mine foremen this year, and the total number of students has increased enormously.

There were 2500 students enrolled in the schools of the Nanticoke Mining Institute, the Shamokin and Mt. Carmel Mining Institute and the Williams Valley Mining Institute in the season which ended this spring. The following table shows the remarkable growth of the first two institutes and their schools since they were founded in 1910:

	Nanticoke Institute Members	Students
1910-1911	500	100
1911-1912	501	128
1912-1913	679	637
1913-1914	821	841
1914-1915	928	1269
	Shamokin and Mt. Carmel Institute Members	**Students**
1910-1911	108	25
1911-1912	254	56
1912-1913	571	763
1913-1914	761	1016
1914-1915	1073	1052

In addition to this the Williams Valley Institute which has just completed its second year, had 295 members and 242 students.

It is not only the men who are instructed in the rudiments and the technical subjects which pertain to mining. During five months of the last season, Mrs. Anna Snyder Lape was employed by the Nanticoke Mining Institute as field secretary for the sewing classes for married women and employed girls. The last month of her time was devoted to a canvass of the houses in the community and she secured no less than 559 applications from women to attend the night school classes in sewing, cooking and English this Fall.

These schools conducted by the Mining Institutes under the direction and authority of the local school boards aided by the State Department of Public Instruction have the hearty support and coöperation of the coal companies whose employees attend them. In the Nanticoke district the Susquehanna Coal Co., the Delaware, Lackawanna & Western Coal Co., the Lehigh & Wilkes-Barre Coal Co., and the Alden Coal Co., are their supporters. In the Shamokin and Mt. Carmel district the companies interested are the Susquehanna Coal Co. and the Philadelphia & Reading Coal & Iron Co. The majority of the students at the Williams Valley Institute schools are employees of the Susquehanna Coal Co.

Similar night schools have been conducted in the boroughs of Plymouth and Shickshinny under the local school board auspices only.

PENNSYLVANIA

Anthracite

Scranton—Suits for coal royalties aggregating $328,906 were commenced against the Lackawanna coal company on August 26, on behalf of the Winton Coal Co. and the heirs of the Anderson, Dean and Livery estates. The money is alleged to be owing for coal mined from beneath portions of the city since 1871. One phase of the case is the request for $50,000 for culm that has been sold by the company after having been washed, the original lease not having taken the small sizes of coal into consideration.

Several houses within the city limits and over workings of the Lackawanna Coal Co. were badly damaged recently by a cave-in. In all five buildings suffered by having foundation walls cracked, the most badly injured building being an apartment house in which six families lived.

Parsons—Thousands of tons of coal are being stocked by the Delaware & Hudson Co. in the large tract of land opposite Hollenback Park. Rumor had it that the company was stocking coal in the event of a strike on Apr. 1 next, but this contention is denied. The coal officials state that stocked coal is subject to taxation in New York state and that the company has transferred its stocking plants to this state.

Mauch Chunk—Due to the numerous floods in the Lehigh River this summer a greater quantity of coal than for some years has been washed down and as a conseuence the river dredgers are more than usually active. About three cars of coal of good quality is being taken daily from the river at this point.

Beaver Meadow—The miners in the Evans Colliery, to the number of 200, went on strike when one of their members was fined by the foreman. After being out 5 days the difficulty was adjusted by the owners of the mine.

Nesquehoning—It has been a good many years since the collieries in this region have experienced so much trouble with water in the workings. While the collieries at this place have been gotten into workable condition, all the other collieries in the Panther Creek Valley are still badly flooded.

Shenandoah—A new bed of coal, over 30 ft. thick, has been discovered in the workings of the Philadelphia & Reading Coal & Iron Co. The present indications are that the vein extends for several miles along the mountain and is of such a size as to insure work for the inhabitants of this place for many years. It will not be necessary to erect a new breaker to take care of the new output, as its proximity to Shenandoah colliery is such that it can be taken care of by that plant without any difficulty.

Pottsville—The rainfall in the anthracite region this season has been almost without precedent as to volume. In six weeks almost 16 in. have fallen and as a conseuence the mines in many instances have been flooded, even with the pumps working to full capacity. As a result it has been impossible to work the lower measures, and in one instance in the Gilberton colliery the water attained a depth of 70 ft. Ordinarily in summer the seepage from the roofs practically ceases, but this year the men are compelled to endure the wet conditions in all parts of the mines.

No recent order of the Philadelphia & Reading Coal & Iron Co. has caused so much comment as the one canceling the vacation privilege of the salaried employees. This company had formerly granted a 10-day vacation to its salaried men with transportation over the lines of the Reading system. With the coming of the vacation period this year the men were notified that not only was the transportation order annulled but the vacation privilege with pay had also been abolished. The new order is causing a great volume of comment among mining men all over the Schuylkill field.

Bituminous

Connellsville—The shipment of coke from the Connellsville region recently broke the year's record amounting to 393,000 tons. This practically cleared all the yards of spot coke. The region is now operating 75 per cent. of its ovens to 95 per cent. of their capacity.

Bakerton—The mines in Bakerton and vicinity are now working full time, all the miners being busy. It is believed that this state of affairs will continue throughout the balance of the year.

Galitzin—The Birds Eye mine is being cleaned out. The operators have not stated whether the mine will be worked immediately or otherwise, but it has been reported that work will be resumed this summer.

Monongahela—More than a dozen coal mines in this valley have doubled their working forces and production in the last 10 days, and production is now at a higher rate than at any time this year. It is stated that this state of affairs is due to the fact that the railroads have decided to store enormous quantities of coal in anticipation of a shortage, because of the export demand and the threatened labor famine. Over 3500 men have been added to the payrolls in this valley.

Uniontown—Reports to the effect that H. V. Thompson, whose too extensive transactions in coal lands were responsible for the closing of the First National Bank of which he was the president, here early in the present year, is about to

emerge from his period of financial difficulties are given considerable attention, inasmuch as it is reported that he is already paying off numerous notes, the past due interest on others and that numerous judgments that have been entered in the past few months are being stricken from the records.

An order increasing the output of the three plants of the Oliver and Snyder Steel Co., near here, from 30,000 to 40,000 tons monthly has been received and will speed the additional tonnage, General Superintendent J. H. Lane will put the plants on a 6-day working basis and employ a full complement of men, about 700 in all. Ever since the shift to the upward tendency in the coal and coke market the Oliver plants have been running 5 days a week, adding weekly to the working force until now they are ready to start full time operations with almost a full payroll. A few more men will be required, however. The output will be consigned direct to the company's steel plants at Pittsburgh.

Punxsutawney—A coal deal involving nearly 5000 acres was closed on August 29, between the Rochester & Pittsburgh Coal Co. and the Buffalo & Susquehanna Coal & Coke Co., two of the largest operating corporations in the bituminous coal region. For 2019 acres of coal in Jefferson, Clearfield and Armstrong counties the Rochester & Pittsburgh Co. has traded to the Buffalo & Susquehanna company a slightly larger acreage in Indiana County in the White Bush Flats region. About 1200 acres in Armstrong county, which the Buffalo & Susquehanna company had planned to mine through a new opening, will now be mined through the Cowanshannock Coal & Coke Co.'s opening at Numine. By the deal the Rochester & Pittsburgh company has lengthened the life of its Adrian operations 4 years, its Helvetia mines 6 years and its Numine workings nearly 20 years. The life of the Sagamore mine, of the Buffalo & Susquehanna Coal & Coke Co., has been increased at least 30 years.

WEST VIRGINIA

Glendale—The Hitchman Coal Co.'s mine north of Glendale has been closed for a short time in order that extensive repairs may be made. Improvements will be made in the fans and in the scales, the shutdown being merely temporary.

Charleston—All the coal mines located along the Little Coal River between Sovereign and Clothier are being operated full time with a full force of men. Nine mines are located between these two towns, and it is said that the operators have sufficient orders on hand to keep them busy for several months.

Hinton—The Miller-Pocahontas Coal Co. recently shipped its first carload of coal. Development of the property was begun Apr. 15 last, and the promoters are congratulating themselves on their rapid progress. This firm has 1083 acres of Pocahontas No. 3 coal on the Gugan River near Mullins.

ALABAMA

Birmingham—A substitute was adopted for the convict bill in the legislature, following an agreement of both sides. The bill provides that no convict of any class shall be worked in the mines of Alabama after Jan. 1, 1920, and no convict under sentence of less than five years shall be worked in the mines after Jan. 1, 1918. There has been a long fight over this bill.

It is understood that application will be made to the Board of City Commissioners by the Sloss-Sheffield Steel & Iron Co. for the relighting of the bee-hive ovens located near the Sloss furnace on First Avenue. Two years ago the city entered into a contract with the Sloss company, whereby in consideration of the city vacating in favor of the company certain parts of Third Avenue and nearby alleys, and withdrawing several damage suits, the Sloss company discontinued the operation of the coke ovens, which have been idle since Jan. 1, 1914. With the present demand for iron, the company is facing a shortage of coke, and it is understood will make application to the city to be allowed to relight the ovens until the rush of orders is completed.

KENTUCKY

Providence—Forty-seven men have been attending the miner's course which is being conducted at Providence by T. J. Barr, professor of mining engineering at the Kentucky State University. Mining, drainage, ventilation, machinery, fires, etc., were covered.

Frankfort—Clay and Jackson counties, Ky., have organized forest protective societies, 50,000 acres being included in the latter county. Lee Craft is president and S. G. Coons secretary of the Clay County Association and Joseph Tussy is president and W. R. Reynolds secretary of the Jackson Association.

Hazard—The Kentucky River Power Co., organized to furnish power to the numerous mining operations in this section has let contracts for clearing the rights of way and erecting poles along them. R. L. Cornell, general manager in charge of the work, and George Johns, foreman of construction, have moved their families to Hazard.

OHIO

Gaylord—The Gaylord No. 2 mine of the Pittsburgh & Cleveland Coal Co. will resume operation shortly at a little over half time. A considerable force of men was recently put to work cleaning up this mine. When started, this operation will employ about 100 men, and after running for a short time, a force of probably 175 men will be employed.

Athens—A gas explosion in Mine No. 6 of the Poston Consolidated Coal Co. near Athens caused a bad fire recently. The blaze was discovered early in the morning and after the local department tried unsuccessfully to stop the blaze the Ohio mining department was notified. The mine was sealed up to burn itself out. It will not be opened for several months.

Conesville—Barnes Mine No. 1, which has been closed down for more than two months for repairs to the tipple has again been placed in operation.

INDIANA

Terr Haute—The officers of district No. 11 U. M W. A. have ordered the closing down of three mines at Bloomsville which have been run on a coöperative plan. It is said that under the agreement between the owners of the mines and the miners the latter could not make as much as if employed under the union scale. The mines are the Menden, Caledonian No. 3 and the John Bull.

ILLINOIS

Monmouth—It is reported that the plant of the Monmouth Mining & Manufacturing Co. will be sold Thursday, Sept. 9, by Refere in Bankruptcy E. U. Henry at Peoria. It is believed that the James Green & Son Co. of Chicago will be the only bidder. The plant is in such shape that it could be started as soon as the new owners assumed charge. It is not thought, however, that operations will be begun before the latter part of September.

Belleville—Fire of unknown origin destroyed the fan house of the Oak Hill mine, near here, recently. The loss is several thousand dollars. The mine belongs to the Southern Coal, Coke & Mining Co.

Damage was done to a number of St. Clair County coal mines by floods during the past week. The airshaft of the Oakdale mine, owned by the Oakdale Coal & Mining Co., was flooded, necessitating a close down for five days. The same thing happened at the Suburban mine, which was idle for several days. Washouts on the Big Four, Vandalia, Southern, Baltimore & Ohio, Louisville & Nashville and Illinois Central railroads prevented shipments from this and adjoining counties and caused losses to the coal men, who were unable to fill orders. Normal conditions have been restored.

Pocahontas—Operations have been resumed at the mine of the Pocahontas Coal Mining Co. The mine had been closed down since last October. It employs 250 men.

Edwardsville—Farmers of Madison County who have lost their wheat and corn crops by rain and flood are planning to dig coal this winter in an effort to recoup their losses. In Foster township, particularly, there is a bed of coal of considerable thickness only a few feet beneath the surface. Few attempts have been made to mine it up to this time because the farmers could occupy themselves more profitably with their crops.

COLORADO

Denver—The Union Pacific and the Colorado & Southern raoilroads have appealed to the state supreme court for a review of recent rulings of the state pubic utilities commission regarding freight rates on coal, requesting that these rates be modified. Attorneys for the railroad companies assert that the new rates "are discriminatory and confiscatory" and that, if necessary, the cases will be carried to the United States Supreme court. If the state court should decide for the roads, appeal will be made for similar consideration of the new passenger schedules.

PERSONALS

George Watkin Evans is at present on a professional visit to Alaska.

C. A. Dorsey was elected trustee at a recent meeting of the creditors of the Wadsworth-Cahaba Coal Co. bankrupt.

Jacques Negru, technical chemist, Denver, has accepted a position with the Utah Fuel Co. and will have full charge of coking operations at Sunnyside, Utah.

G. A. Luckenbach, 1637 Jefferson Ave., Scranton, Penn., has been appointed factory representative in the anthracite field for the Koehler Co., Marlboro, Mass.

Walter E. Guller, formerly chief engineer of the Consolidated Indiana Coal Co., was recently appointed superintendent by the receiver for that company to succeed. J. R. Sharp, resigned.

A. R. Beisel, formerly superintendent of the Holden Mines of the United States Coal & Oil Co., has been appointed general manager of that firm, with offices at Stone, Ky.

E. J. Knickerbocker, assistant to the vice-president, was recently promoted to the duties of first assistant general sales agent, coal department of the Central Coal & Coke Co., Kansas City Mo., vice A. P. Moore, resigned.

Gustav Boehmer, president of the Boehmer Coal Co., of St. Louis, Mo., who had been in ill health for a year past, went to Lake Minnetonka six weeks ago. In a letter to his son, Will Boehmer, he says he is feeling fine and goes rowing every day although he is 67 years old.

Charles S. Snyder, for some years representative of the Buffalo & Susquehanna Coal & Coke Co., in central New York, with headquarters at Syracuse has taken a similar position with the Lehigh Valley Coal Sales Co. The vacancy has been filled by the appointment of H. S. Bradfield, of Buffalo.

Tom L. Lewis, formerly president of the United Mine Workers of America and later owner and editor of the Coal Mining Review in Columbus has been appointed secretary of the High Volatile Coal Operators' association of West Virginia. He will make Charleston, W. Va., his headquarters.

Hon. James E. Roderick, chief of department of mines of Pennsylvania, on Aug. 25 appointed C. H. Crocker, of Johnstown and Patrick S. King, of Smithfield to be inspectors of mines in the Bituminous region. Mr. Crocker will have headquarters at Blairsville and Mr. King in Freeport, they will take office on Sept. 15, 1915.

W. E. Mathews, for two years superintendent of the Mount Braddock plant of the W. J. Rainey Co., has resigned on account of ill health. D. K. Dillworth, chief clerk at the plant, is now acting as superintendent. For the present Mr. Mathews will remain at his home in Uniontown, Penn.

OBITUARY

W. C. Hill a prominent coal mine operator at Blanche, Cherokee County, Ala., was found dead in bed recently, dying from heart failure.

William Krumlauf, aged 62 a well known coal operator died at Alliance, Ohio, recently after an illness of several weeks.

Morgan Davis, Jr., aged 48 years, one of the foremost mining engineers in the anthracite region and a successful mine promoter, died Aug. 25, in a Scranton private hospital following 6 weeks illness of blood poisoning and pneumonia. He was a native of Mt. Carmel and a graduate of Lehigh University. Mr. Davis came to Scranton in 1895 to take charge of a department of the "Colliery Engineer," but later became a promotor of coal mining companies. The European war prevented the completion of a plan for consolidating a number of West Virginia coal mining companies whereby English capitalists were to found a fifty million dollar corporation, under Mr. Davis's management.

INDUSTRIAL NEWS

Pittsburgh, Penn.—The Goyne Steam Pump Co., of Ashland, Penn., is now represented in western Pennsylvania, eastern Ohio and West Virginia by the Harris Pump & Supply Co., 320-22 Second Ave., Pittsburgh, Penn.

Chicago, Ill.— The Gifford Wood Co. recently moved its office to the Sharples Building, in which it now occupies the entire second floor. This firm now has desirable office quarters and larger room for carrying and displaying its stock of machinery and tools.

Martins Ferry, Ohio—The Rail & River coal mine No. 1 recently broke its record for output for one day by putting out 2500 tons of coal. It also broke another record in working five days during the week. At this mine the coal is transported underground about three miles.

Huntington, W. Va.—Five million tons of coal held up in the Kanawha River awaiting a favorable stage was recently started southward. The majority of this shipment was to Cincinnati. The completion of lock and dam 28, aided by a rise in the river, made the shipment possible.

San Francisco, Calif.—A contract has just been closed for the erection in Honolulu of the largest vessel coaling plant on the Pacific, with the exception of the one at the Panama Canal. The plant will have a capacity of 165,000 tons and the contract price is $1,000,000, and will be built for the Inter-Island Navigation Co.

Pottsville, Penn.—The Philadelphia & Reading Ry. Co. recently started placing additional sidings adjoining the trackage at the coal dock at Palo Alto. The purpose is to store approximately 5000 tons of bituminous coal against the contingency of a strike in the hard coal regions next spring. Two thousand four hundred tons of coal are already stored on the dock.

Boston, Mass.—The rumored sale of the Garfield Proctor Coal Co. wharf at New Bedford, Mass., to the Pocahontas Fuel Co., and recent negotiations for a site at Portland, Me., by the same company are developments that are being watched with some interest. On the surface it looks as if some of the established houses would have a formidable competitor for inland tonnage.

Philadelphia, Penn.—A record freight rate for carrying coal will be paid to the Danish steamship "Gurre." This vessel has been chartered to carry a cargo of 3000 tons to Coquimbo, Chile, for which she will receive $12 per ton, or nearly $40,000, which is about one-third the value of the vessel. The coal, which is bituminous, brings about $1.50 f.o.b. mines. The consignees, however, will pay nearly $20 a ton.

Charleston, W. Va.—July established a coal tonnage record for the Norfolk & Western R.R., the tonnage for that month surpassing that of June by 173,980 tons. During July this road hauled 2,854,445 tons, as compared with 2,680,465 tons in June, which was up to that time the largest month's traffic in the history of the road. It is firmly believed by railroad officials and mining men that the record for August will considerably exceed that of July, and that the 3,000,000-ton mark is not far distant.

Buffalo, N. Y.—There is a move to induce the coal roads to place a charge of $2 on all cars reconsigned in transit. Some of the leading mine owners are asking it and it is believed that all will join in the request when it is understood. This will cut off the shipping of cars in quantity to various parts of the country unsold and oblige the mines to hold their coal back till there are orders for it. It always happens when the market runs dull that certain mines will flood the country with consignment coal in order to keep running. This ruins what firmness there may be left and sets consumers to waiting for coal under demurrage.

New Orleans, La.—It is considered a matter of some doubt, in general industrial and transportation circles here, whether the railroads will profit by the ruling of the Interstate Commerce Commission, and increase the coal rate from Alabama fields, from $1.25 to $1.40 per ton. The decision of the commission denied the carriers the right to maintain the $1.25 rate on bunker coal, and made the order applicable only on a general advance including both bunker coal and coal for city delivery. If the railroads advance the bunker rate 15c. per ton, they will lose the business of harbor delivery to the Pittsburg fields through river competition. In recent contracts signed by local coal dealers, the latter invariably stipulate the purchaser has to pay the increased rate in the event that the roads follow the ruling of the commission.

Charleston, S. C.—Announcement was made recently from the offices of R. L. McKeller, assistant freight traffic manager of the Southern Ry., that the modern export coal-handling plant which has just been completed at Charleston, and which will give the Southern facilities unexelled for the handling of coal, will be opened shortly. In view of the great demand for export coal from this country, the completion of the handling plant is regarded as particularly auspicious. Millions have been expended in building the plant, providing a storage yard of 400-car capacity and making additions to passing tracks along the Southern lines over which the coal will pass. The Charleston terminal will have a capacity of 40 cars, or 2000 tons an hour, which is said to be as fast as any ship now in the coal carrying trade can take the coal. It will be operated entirely by electricity and will deliver coal into the holds of the ships with a minimum of breakage by means of an electric conveyor.

Coal Trade Reviews

General Review

Tendency to hold closer to the circular in the anthracite trade. Incipient car shortage developing in the bituminous regions. Deadlock in British labor negotiations creates renewed interest in export trade. Reports generally more optomistic.

Anthracite—Most forehanded buyers concluded their purchases at the lower prices prevailing earlier in the season and the final addition to the company's circular, bringing quotations up to the full winter schedule, developed scarcely any last-minute buying. On the other hand, orders have been substantially less than normal throughout the summer, while the recent unseasonably cool weather has served to stimulate interest in the market, and there is a notably stiffer tone to the anthracite situation. The season opened with a better feeling in hard coal circles than for a long time and, while there is still plenty of coal available at concessions on the regular circular, there is a well-defined tendency noted in all quarters to get closer to these figures. The light buying among consumers for storage purposes throughout the summer, and the fact that the large companies are accumulating unusually heavy stocks, indicate an exceedingly healthy condition in the anthracite trade.

Eastern Bituminous—A shortage of labor and a restricted car supply, the first indicia of an active coal market, are at hand. Car shortages are reported on both the Pennsylvania and the B. & O., while other lines have been forced to put their shippers on a restricted allotment. The improvement so far is reflected in the larger volume of coal moving rather than in any increase in prices, but there is no doubt that producers are becoming more optimistic, and there is a definitely better tone to the market.

Exports—The apparent deadlock in the British labor negotiations has created new interest in the foreign trade and resulted in more inquiries from abroad. While the accumulation at some of the Atlantic seaboard terminals is, perhaps above normal, this coal is in most instances, only waiting vessel tonnage. When foreign consumers are definitely convinced that British shippers will be more or less out of the market for the balance of this year, at least, the export business is scheduled for one of the most remarkable booms in the history of the American coal trade.

Lake Trade—There is renewed activity in nearly all branches of the Ohio trade. The gradual increase in the demand for domestic coal, due in part to the recent unseasonably cool weather, is forcing dealers into the market and there is a strong feeling that this improvement will be consistently maintained until the fall trade opens up. The occasional tonnages of consignment coal, forced sales of which have had such an unsettling influence on the market, have now practically disappeared. There are persistent rumors to the effect that the railroads are accumulating large stocks against emergencies and manufacturing concerns are generally increasing their working schedules. The restricted movement in the Lake trade continues the chief depressing factor in the current situation. The improvement is also noticeable to the South, though it is confined more particularly to the volume of coal moving rather than to prices.

Middle Western—The recent cool weather has stimulated buying somewhat and further price advances are under consideration, but in view of the unfavorable response to the recent increases, it is hardly likely that this will be attempted at the present time. The heavy floods in the district tributary to St. Louis, interfered with the movement to such an extent that prices were temporarily forced up though they have since reacted to their former level. The delayed crop movement due to the wet weather, has delayed country buying because of the scarcity of money. The dull market shows a slow but perceptible betterment; increased activity is noted in the steam lines and there is a broader market for the domestic grades.

A Year Ago—Anthracite slows down to a more conservative basis. Much of the West Virginia high-grade bituminous fuels are now out of the market. Large contract closed with Italian government. Internal business adversely affected by slow industrial conditions.

BUSINESS OPINIONS

Boston News Bureau—The paramount factor in the situation today is the position of sterling exchange. A year ago demand sterling bills sold at $5.06. The strength was based on the fact that we owed Great Britain between $300,000,000 and $500,000,000. The banks would not surrender gold at first. They held to gold bills like grim death. A gold pool of $100,000,000 was formed. The pool, however, supplied only absolute wants, but it acted as a weight upon the market and probably prevented demand sterling going higher than it did. But we could see ahead well at that time. We knew that the time was not far off when the balance of trade must turn in our favor, which it did. Today Great Britain owes us three or four times as much as we owed her a year ago on current account, and the amount is daily increasing. Moreover, she cannot see any means of settlement except by gold, a loan or liquidation of our securities. A sufficient amount of gold is inaccessible, and British investors are loath to dispose of their American securities in quantities. So far as her balance of trade is concerned, it is bound to be heavier against her.

Dun — Intrinsically sound fundamental conditions more than offset the adverse influence of existing problems and uncertainties. While increased conservatism is natural under the circumstances, general business has nevertheless made further gains and belief in sustained improvement remains unshaken. Wall Street has given a notable demonstration of confidence after a brief period of unsettlement and though stability has not yet been restored in the foreign exchange market, an adjustment of the present difficulties is expected to result from the negotiations now being conducted. Another large French credit has been established here and New York has assumed a commanding position as the financial center of the world.

Bradstreet's — Uplifting factors continue to assert themselves in trade and industrial circles, but at the same time there is a degree of unevenness in particular sections and certain industries that deprives the situation of uniformity. However, optimism as to the future seems unabated; our international political relations, apparently grave early in the week, appear to have improved; house trade at various centers has been increased by the presence of visiting buyers; some sections report larger road orders; mail-order trade goes on increasing; the southern situation is brighter; money everywhere is plentiful at low rates.

Southern Lumberman—Yellow pine is steadily increasing in price strength, and though orders actually booked this week are scarcely in excess of the volume recorded last week, inquiries are more numerous and the business placed has been at better figures. Nearly all the large manufacturers have issued new price lists since Aug. 1, and some have instructed salesmen to quote advances on lists issued during the past ten days. Better domestic demand for hardwoods is reported from both producing and distributing centers, though this is offset somewhat by lessening in exports, both demand and shipments. While the export movement probably would have kept up to what has been done for the past three or four weeks if shipping space had been available, a slackening in British demand is also reported this week, due to recent shipments from this country.

Marshall Field & Co.—Wholesale dry goods distribution has not been as heavy this week as during the corresponding week a year ago, although the number of buyers in the market has been about the same. The outlook for supplies of imported lines of merchandise was not at all promising a year ago on account of the war, and consequently caused a great rush of buyers to the market and created heavy road sales. Conditions this year surrounding supplies of merchandise are well known, so that it is only natural that immediate distribution would not compare with that of a year ago. Merchants continue to feel optimistic toward fall business. Collections are about normal.

ATLANTIC SEABOARD

BOSTON

Pocahontas and New River market unchanged. Good fall prospect for large export trade. Georges Creek receipts light and Pennsylvania operators look for better demand later. Water freights easy. Anthracite slow.

Bituminous—September opens with no important change in the market for the Hampton Roads coals. Prices less than $2.85 f.o.b. are only occasional now, most of the large shippers being well enough supplied with export orders to move the surplus over coastwise contract requirements. Receipts on contract here are about as usual but there is no spot demand worth mention. The vacation season is now nearly over and it is possible inquiry will improve as the month advances.

Shippers are taking a more hopeful view of the market. The off-shore business is expected to show no let-up for months to come and prices for future delivery are being firmly held. Indeed, there are some who predict that the export trade will be heavier than ever when it is realized particularly in South America that British shippers are out of the market at least until well into 1916.

The Georges Creek shippers are among those who look for an active foreign demand. In August there was a little falling-off in tonnage, but this is expected to be more than made good during September and October. The volume of this grade coming here is still relatively small, although prices are as firm as ever.

The Pennsylvania grades are extremely dull, output being closely held down to contract requirements. There is some hope now of a better demand by the end of this month, particularly if the Southern coals are firm at $2.85. The fact that certain shippers who ordinarily do a large bunkering business in these grades are not likely to be under their usual pressure to make terms may have a bearing on negotiations with the mine-workers next spring.

Water Freights show no change, although the charter demand is perhaps as nearly nil as at any time this year. There is some likelihood of several sailing vessels coming back into the coastwise trade during the fall. More American bottoms have been off shore this year than any year since 1863.

Anthracite—Quite an amount of business was entered the last few days of August in order to save the last monthly advance, but trade is sure to be slack again for a fortnight or so after Labor Day. It will take a better demand at retail than exists now to make much room for September shipments. All the domestic sizes are in plentiful supply, with chestnut the long size. Suprisingly little is heard in this territory from the individual houses.

Bituminous prices at wholesale are about as follows:

	Clearfields	Cambrias Somersets	Georges Creek	Pocahontas New River
Mines*	$0.85@1.40	$1.15@1.60	$1.67@1.77	
Philadelphia*	2.10@2.65	2.40@2.85	2.92@3.02	
New York*	2.40@2.95	2.70@3.15	3.22@3.32	
Baltimore*	.....	.....	2.85@2.95	
Hampton Roads*	.....	.....	.....	$2.75@2.85
Boston†	.....	.....	.....	3.50@3.68
Providence†	.....	.....	.....	3.55@3.68

* F.o.b. †On cars.

NEW YORK

Bituminous situation shows more snap. Mine prices increase. Outlook for busy fall promising. Railroads place large orders. Anthracite shippers hopeful. Many inquiries received. Mines working better. Companies storing coal. Full winter circular goes into effect.

Bituminous—There has been a decided improvement in the soft-coal situation. Demand has increased generally and there has been a substantial advance in mine prices for certain grades. The railroads are largely responsible for the changed conditions. One road is said to have placed an order for nearly one million tons of such coals at Latrobe and Greensburg, to be stored at various points. As a result these coals have been practically taken out of the market for the present.

Tidewater conditions have not as yet felt the improvement but it is the general opinion that in a few weeks business will be active. Mines in the central Pennsylvania fields are working on a three to four day-a-week basis. Car shortages have developed on both the Pennsylvania and Baltimore & Ohio. Many mine workers have left the regions for their native countries but it is not known how seriously this will affect mining operations.

The export situation is holding up. There is little talk being indulged in but it is known that some shippers of Pocahontas coals have gone on the outside to complete cargoes. The situation in Wales has caused many inquiries here and the outlook is encouraging for American exporters. Freight rates continue high. Bunker coals are still in good demand.

Current quotations are on the following basis:

	South Amboy	Port Reading	St. George	Mine Price
Georges Creek Big Vein	$3.20@3.30	$3.20@3.30	$3 20@3.30	$1.75@1.85
Georges Creek Tyson	2 90@3.00	2 90@3.00	2.90@3.00	1.35@1.45
Clearfield:				
Medium	2.65@2.80	2.55@2.65	.....	1.10@1.25
Ordinary	2.55@2.60	2.55@2.60	.....	1.00@1.10
Broad Top Mountain				1.10@1.45
Cambria County:				
South Forks	2.90@3.05	.....	.....	1.35@1.50
Nanty Glo	2.75@2.80	.....	.....	1.20@1.25
Barnesboro	2.65@2.70	.....	.....	1.10@1.15
Somerset County:				
Quemahoning	.....	2.70@2.85	2.70@2.85	1.20@1.30
Medium	2.65@2.70	2.60@2.65	2.60@2.65	1.10@1.15
Latrobe	2.45@2.55	.....	.....	.90@1.00
Greensburg	2.75@2.80	.....	.....	1.10@1.15
Westmoreland	3.15@3.20	.....	.....	1.35@1.45
West Virginia Fairmont		2.60@2.70	2.60@2.70	.80@ .90
Fairmont mine-run		2.45@2.55	2.45@2.55	.75@ .85
Steam		2.45@2.50	2.45@2.50	.90@ .95
Western Maryland		2.35@2.40	2.35@2.40	.85@ .90

Anthracite—The fall season opens with a better feeling in the anthracite coal situation. Dealers are beginning to stir and there are prospects of a busy fall and winter ahead. Mines are working on a better schedule with the companies storing all surplus coals. The West is not taking so much coal while the reverse can be said of the East. Inland dealers are getting busy. One reason advanced for the slow buying during the spring and summer was the refusal of dealers to extend credit and the first touch of cold weather will bring orders for quick deliveries.

The last monthly advance of ten cents per ton on prepared sizes was made on Sept. 1, the companies winter schedule going into effect on that date. While it is too early to give any definite figures on shipments of anthracite during August it is expected they will show a reduction as compared with the corresponding month of 1914. There is no great surplus of hard coal on hand. Nut coal which was the weakest of the prepared sizes is not so pressing but is being offered by individuals at from 25 to 35c. off companies' circular. Egg coal continues plentiful and is being quoted at about 35c. off with stove at 25c. below circular.

The steam coal situation shows but little improvement. There is no surplus because of the mining restrictions. Nos. 2 and 3 buckwheats are practically out of the market. Pea coal of the better grades is quoted at from $3.15 to $3.25. Buyers of No. 2 buckwheat are not promised shipments inside of ten days.

Current quotations follow:

	Lower Ports		Upper Ports	
	Circular	Individual	Circular	Individual
Broken	$5 05		$5.10	
Egg	5 30	$4 80@5.30	5.35	$4.90@5.35
Stove	5.30	4 80@5.30	5.35	4.90@5.35
Chestnut	5.55	5 00@5.55	5.60	5.10@5.60
Pea	3.50	3 25@3 50	3.55	3.50@3.55
Buckwheat	2.75	2 25@2 75	2.80	2.25@2.80
Rice	2.25	1 75@2.25	2.30	2.00@2.30
Barley	1.75	1.45@1.75	1.80	1.75@1.80

PHILADELPHIA

Anthracite shows improved tone, with good trade in sight. Most sizes still offered off circular, but prices show tendency to stiffen, especially pea. Bituminous improved, and brisk exports continue, with vessel tonnage short and rates high.

Anthracite—There have been unmistakable signs of improved business the past week. Buyers who have held off until the last minute to lay in their winter fuel supply are beginning to send in their orders influenced no doubt by the real fall weather that prevailed the latter part of August. Practically all the representative dealers are stocked to capacity and they state it is their intention to carry full supplies for an indefinite period. After Labor Day it is expected the movement of coal will begin in real earnest, as that marks the end of the vacation period, with schools opening and families all home.

There is still plenty of coal to be had at prices less than circular. Egg continues in demand at a fair price while on stove $3.70 is about the average, showing it is rather weaker than a month ago. Chestnut is still variable as to price, fluctuating from April circular up to current circular; although the latter figure is being asked in a few instances there are actually no sales being made. Pea is a little firmer, probably because the individuals have booked about all they care to at the unusually low prices prevailing all summer and they are now trying to secure from ten to twenty cents more on present offerings.

There is a definite tendency on the part of both the big shippers and the individuals to really get nearer the full circular prices now that the expectation of a brisk fall and winter trade is in sight. The retail men, however, seem to hesitate to put in effect the fall and winter rates. This is usually customary with the first of September, but for the time being they are sharing with their customers the advantage they have had in buying. This surely will not last very long now and a few more cold days will see prices at the full winter level.

This week the producing interests announced the full fall and winter circular prices effective Sept. 1, which are as follows, to which the Pennsylvania State tax of 2½% must be added:

	Line	Tide		Line	Tide
Broken	$3.50	$4.75	Pea	$2.50	$3.25
Egg	3.75	5.00	Buckwheat	1.25	2.25
Stove	4.00	5.00	Rice	.85	1.75
Chestnut	4.15	5.25	Barley	.50	1.50

Bituminous—While there has been nothing noticeably brisk about the business this past week, there is undoubtedly a better tone and most of the shippers are really optimistic, feeling that the worst is now behind them, with indications of an active season ahead. The only activity of the week was still confined to slack coal; there has not been any particular large change in prices and there is no doubt that the slight stringency will be overcome with the increased demand for the other sizes.

The news of the export trade is only a repetition of the story for several months past—brisk, with an ever increasing volume of inquiries. The one great difficulty continues to be the difficulty in making charters. There is only a light tonnage offering, most owners holding off, feeling that still better rates are a certainty. The ruling prices are as follows:

Georges Creek Big Vein	$1.65@1.75	Fairmont gas, mine-run	$1.15@1.25
South Fork Miller Vein	1.50@1.60	Fairmont gas, slack	.70@ .80
Clearfield (ordinary)	1.00@1.20	Fairmont lump, ordinary	.85@ .95
Somerset (ordinary)	1.00@1.15	Fairmont mine-run	.75@ .80
West Va. Freeport	.85@ .95	Fairmont slack	.55@ .65

BALTIMORE

Market steady with tendency toward slight gains. Anthracite trade increasing. Export business increasing.

Fairly cheap coal is still offering considering the near approach of fall and winter. Lower grade fuels of West Virginia and Maryland are still to be had at around 85 to 90c. Pennsylvania ordinary fuels are bringing around 90c. to $1 at the mines. Medium to best coals call for $1.10 to $1.35, or $1.40 in some cases.

Anthracite dealers are feeling more confident over the situation. Household sizes for storage are now in fair call for early September. Many of the hard-coal men believe that the late September and October business will be very heavy, because nothing like the usual amount of spring purchasing took place.

Export business took a jump. During the week a total of 66,670 tons was loaded here for foreign ports. The previous week had shown a little more than 52,000 tons, and the week before that not quite 23,000 tons.

HAMPTON ROADS

Movement foreign still good. Prices firm with a steady foreign demand for New River and Pocahontas.

The coal movement from tidewater during the week has been heavy. The Italian ports are still getting the largest share of the export business and as usual the largest percentage of the coastwise movement has been to New England. The quantity supplied to steamers for bunkers has shown up well and although the number of steamers calling here may not be up to normal, the quantities taken are excessive.

In addition to the demand for standard grades of run-of-mine there has been some inquiry for nut and slack coal for the New England market and some large shipments have moved. The accumulation on the railroad yards is perhaps somewhat in excess of the normal supply but as a large number of the shippers have contracted tonnage due it is necessary that large quantities be kept to take care of vessels promptly.

During the past week the Virginian Ry. dumped over their pier in twenty and one-half working hours 614 cars or about 30,500 tons of coal. This is quick work seeing that only one dumper is used at this pier.

Railroad Tonnages—Dumpings over the local piers for the past several weeks compare as follows:

Railroad	Week Ending July 31	Aug. 7	Aug. 14	Aug. 21	Aug. 28
Norfolk & Western	188,593	135,357	171,252	172,546	211,699
Chesapeake & Ohio	84,018	110,861	83,390	129,826	103,472
Virginian	39,335	64,397	63,066	77,136	82,131
Totals	311,949	310,515	317,708	379,508	397,302

Ocean Charters, Clearances and Freights

OCEAN CHARTERS

The following charters have been reported from various sources during the past week:

PHILADELPHIA

Vessel	To	Tons	Rate
Josephine	Puerto	842	4.75[1]
Gurre	Coquimbo	1847	12.00
F. C. Pendleton	St. John	346	1.90

[1] Option coal and coke $6.50 and $11.50 respectively.

BALTIMORE

Ecclesia	Italy	2385	
Sidmouth	Italy	2605	
Senator	Italy	626	
Roland	Gothenburg	2563	
Martee	Italy	2399	9.90
Elline	Italy	2780	9.90
Carl F. Cressy	San Juan	767	
Silverton	River Plate	1723	
Charlton	Piraeus	1937	9.96
Titania	Italy	2173	
Sesostris	Savana	1968	
Liguria	Italy	1958	
Evandale	Savona		

[1] Or Virginia.

VIRGINIA

Vessel	To	Tons	Rate
Kintail	Rio Janeiro	2252[2]	8.16
James B. Drake	Rio Grande	991	9.00
Sliedrecht	Bahia	1951	9.84
Marte[1]	Italy	2399	9.90
Ellin[1]	Italy	2780	9.90
Constantinos	Buenos Aires	1663	8.04
Hassel	Buenos Aires	2589	8.13
Georgios	Marseilles	2077	8.88

[2] 3 500 tons per day discharge, Sept.
[1] Or Baltimore.

ATLANTIC RANGE

Franklin	Mediterranean		

Note—Steamers are indicated by **bold face type**, all others being schooners.

VESSEL CLEARANCES

The following steamers have cleared from Hampton Roads Aug. 20 to Aug. 27:

NORFOLK

Vessel	Destination	Tons
Circe[1]	Gibraltar for orders	3,790
Labor[2]	Savona	6,000
Orealla[3]	Naples	2,822
Southerndown[4]	St. Nazaire	5,448
Concetina[5]	Kingston	1,500
Mar Adriatico	La Plata	4,288
Penhale	Buenos Aires	5,910
Maria C.	Porto Ferrajo	4,250
M. Emmiricos	Piraeus	
Rosina	Montevideo	3,388
Buxton	Spezia	4,532
Achilles	Canal Zone	12,000
Livatho	Spezia	3,915
Wegadesk	Canal Zone	6,500
Scillin	Naples	4,536
Giovanni G.	Civita Vecchia	5,140
August	Genoa	8,800
Sebastiano	Naples	5,900
Trodenskjold	Curacao	5,460

NEWPORT NEWS

Vessel	Destination	Tons
Winnebago[6]	Rio de Janeiro	5,900
Lucinda[7]	Rio de Janeiro	1,820
Zoorichmoor	Taranto	5,500
Teespoole	Rio de Janeiro	6,261
Tairopinas[8]	Maddalena	4,400
Oaklands[9]	Marseilles	5,500

NEWPORT NEWS

Vessel	Destination	Tons
Commonwealth	Port Militar	4,300
Heina	Havana	4,570
North Pacific	Buenos Aires	6,800
Coquet	Marseilles	4,600
Salamis	Italian Port.	5,560

BALTIMORE

Vessel	Destination	Tons
Claveresk	Cuba	6,100
Allanton	Italy	5,866
Andros	Greece	4,407
Georgios	Italy	5,057
Evandale	Italy	5,156
Newstead	Cuba	4,000
Harmattan	Italy	6,200
Roland	Sweden	6,243
Liguria	Italy	4,435
Othon Stathalos	Uruguay	3,335
Ecclesia	Italy	5,300
Orion	Italy	4,300
Sidmouth	Italy	5,300
Senator	Cuba	971

[1] Flat Top Fuel Co. [2] Pocohontas Fuel Co. [3] Chesa. & Ohio C. & C. Co. [4] Baker-Whiteley Coal Co. [5] Hasler Bros. Co. [6] Berwind-White C. M. Co. [7] C. H. Sprague & Son. [8] New River Coal Co. [9] West Va. Coal Co.

OCEAN FREIGHTS

A number of steamers have been chartered to load coal for South American and West Indian ports. Plate rates are practically the same as a week ago. Mediterranean rates are firmer; several steamers were chartered last week at $10.16.

The freight market is now quotable as follows:

To	Rate	To	Rate
Havana	$2.50@3.00	Bermuda	**$3.00**
Cardenas or Sagua	3.00@3.50	Vera Cruz	3.25@3.75
Cienfuegos	3.25@3.50	Tampico	3.25@3.75
Port au Spain, Trinidad	3.75	Rio	8.28@8.40
St. Lucia	3.50@3.75	Santos*	8.40@8.64
St. Thomas	3.00@3.25	Montevideo	**8.04**
Barbados	**3.75**	Buenos Aires or La Plata†	**8.04@8.16**
Kingston	2.75@3.25	Rosario	**8.40**
Curacao	3.25	West Coast of Italy	9.84@10.08
Santiago	2.75@3.25	Barcelona**	9.12@9.36
Guantanamo	2.75@3.25	Valparaiso or Callao	7.00
Demerara	4.50@5.00	Marseilles	9.36@9.60

Note—Rates noted in **bold face** type are only approximate.
* Consignees paying dockage dues. ** Spanish dues for account. † Quotations on Plate coal by British steamers; neutral steamers are more difficult to obtain and the rates are always higher.
W. W. Battie & Co.'s Coal Trade Freight Report.

Note—Charters for Italy, France and Spain read: "Lay days to commence on steamer's arrival at or off port of discharge. 24c. per net register ton per day demurrage."

NOTES

Sweden—Arrangements have been completed for the export of 600,000 tons of coal from Germany to Sweden.

Philadelphia, Penn.—The U. S. Government has recently been arranging charters with steamers to load coal at Atlantic Range ports for San Francisco and various other Pacific coast naval stations. The first charter was for $4.85 per ton to San Francisco.

LAKE MARKETS

PITTSBURGH

Continued though slow improvement, with excellent line demand and light Lake shipments. Operations fully 60% of capacity. Recent advance in contract coal easily maintained.

The local coal market continues to improve, although rather slowly. The line demand is now described as excellent. The steel mills continue to run full and are taking somewhat more coal than a week ago. Railroad requirements have increased slightly. Lake shipments continue light but hope continues that there will be a slight spurt at least toward the close of the season. Some of the mines are operating nearly full, and while there are many operating three days a week or less they are usually the smaller mines and the operation of the Pittsburgh district as a whole is fully 60% of rated capacity.

There is still a surplus of free coal offered and prices are not quotably higher, although they are certainly firmer. The higher quotations lately in evidence on contract coal are very well maintained, operators feeling confident the market will be better in all respects later on. There has been little buying by retail dealers thus far but the fall movement is beginning in domestic coal. For free coal the market is quotable firm as follows: Slack, 50@60c.; nut and slack, 90@95c.; nut, 95c.@$1; mine-run, $1@1.05; ¾-in., $1.10@1.15; 1¼-in., $1.20@1.25, per net ton at mine, Pittsburgh district. On contracts to Apr. 1 the market is firm as follows: Slack, 85@95c.; mine-run, $1.15; ¾-in., $1.25; 1¼-in., $1.35.

BUFFALO

Car and labor shortage developing. Prices unchanged but notably stiffer. Anthracite companies stocking heavily in anticipation of a heavy winter demand.

Bituminous—The steady, though rather slow improvement promises to be hastened soon by a general shortage of both cars and men. Coal roads are beginning to put the mines on allotments of cars and some of the mines find that they have not men enough to meet sudden demands on them. There is every prospect of serious difficulty from both these sources early in the fall trade, as soon as the crops begin to move. At the same time the circular prices of bituminous are not higher, though they are more firm, slack going on a par with sizes. Some of the leading Pennsylvania coal companies have made a new price for Buffalo territory, 5c. lower than the last one, being, with freight added, $2.65 for lump, $2.50 for three-quarter, $2.40 for mine-run and $2.05 for slack. This will be the official Buffalo list of prices till further notice.

In a general way the Buffalo market is doing fairly well. There is now a feeling on the part of consumers that they should carry some coal. Cars are going to be short and the prospect of labor difficulties increases. Strikes are nearly certain in the early spring, and they may be preceded by other stoppages in the same line. Besides the actual consumption of coal is increasing steadily.

Anthracite—It is expected that the demand will begin to increase in a few days. What increase took place near the close of August was on account of the ten-cent reduction and was not large, as those who cared to take advantage of it had mostly done so when more reduction was offered. Buying during the summer has been as light as in any recent summer, yet the fall and winter trade may turn out not to be very heavy. People who have been out of work are doubling up their families and saving fuel.

The anthracite price this month resumes the maximum, which is $5.60 for grate, $5.85 for egg and stove, $6.10 for chestnut and $4.30 for pea, all f.o.b. Buffalo, with 25c. addition for loading on vessels. This includes the Pennsylvania state tax.

There is much report of coal being put into stock by the anthracite companies, which is an indication that they are confident that there will be a time before spring when they will be unable to meet the demand. Stocking coal is expensive and it also injures the market price of it. Shipments by Lake are not very active. One of the heaviest shipping docks is doing very little, on account of the congestion at upper-lake ports. The shipment for the week was 109,100 tons.

COLUMBUS

Increase in the demand for domestic sizes. Prices firmer and the tone of the market is improving. Manufacturing demand steadily increasing and railroads are stocking.

Renewed activity is reported by all branches of the coal trade during the past week This is especially true of the domestic trade where the demand is better and the vo. of business increasing. Steam business is also rather ac and prospects for the future are considered brighter.

Retailers who are now able to move their stocks are in market for more coal; stocks are not as large as was s posed and they are buying freely for immediate shipme Rural dealers are also experiencing a better demand since t rains have ceased. Retail prices are firmer all along t line. Pocahontas and West Virginia splints are still in goc demand and there is some stocking of Hocking lump. An thracite is coming into the Columbus market in larger quan tities.

Steam business is also more active as manufacturing is steadily improving, especially along the line of making war munitions. Railroads are stocking up along their lines to guard against emergencies. Steam prices are strong and there is a notable absence of cheap demurrage coal on the Columbus market.

The Lake trade is rather active although the larger part of the tonnage shipped from Ohio ports is mined in West Virginia. The movement off the docks of the Upper Lake ports to the interior is better and a number of operators are rushing large quantities to the Northwest. Dock prices remain unchanged. The Toledo docks of the Hocking Valley handled 116,000 tons last week. More strength has developed in Pocahontas although some cutting in the last circular list is reported.

Prices in Ohio fields are as follows:

	Hocking	Pomeroy	Eastern Ohio	Kanawha
Re-screened lump	$1.45	$1.50		
Inch and a quarter	1.35	1.35	$1.25	$1.30
Three-quarter inch	1.25	1.25		1.25
Nut	1.15	1.25		1.15
Mine-run	1.05	1.10	1.00	1.05
Nut, pea and slack	0.65	0.70	0.55	0.65
Coarse slack	0.55	0.60	0.45	0.55

Mines have been working at about the following percentages of full capacity:

District	Week Ended Aug. 7	Aug. 14	Aug. 21	Aug. 28	District	Week Ended Aug. 7	Aug. 14	Aug. 21	Aug. 28
Hocking	25	25	30	35	Cambridge	30	35	35	35
Jackson	20	20	20	20	Masillon	25	30	50	35
Pomeroy	25	40	40	45	Eastern O.	30	55	55	55
Crooksville	30	30	30	30					
					Average	30	33	34	38

CINCINNATI

A generally stronger market is noted. Demand improving somewhat in all lines.

A gradually improving demand for the domestic grades is the most significant feature of the market during the past week. This movement from now on should increase steadily as the bulk of the winter stocks are yet to be handled. The relative scarcity of nut and slack, due to the sub-normal domestic demand, is still the strongest factor in the steam market. In some lines of industry, especially the steel and machinery trades, plants are actively engaged, and require a maximum amount of fuel, but the general industrial situation remains such that the coal requirements are not sufficient to make a strong steam market.

TOLEDO

Considerable coal passed through Toledo ports in August. Ore movement shows improvement. Possible car shortage predicted.

Toledo coal dealers who have just returned from the upper docks claim that the supplies there are extremely heavy and are not moving as rapidly as could be desired. This of course will keep the Lake traffic down unless the situation there should change notably within a short time.

Some concerns report Pocahontas and smokeless coals as showing a trifle weakness; others are entirely sold up and predict a heavy demand for all smokeless coals a little later on due to the general opening of business in the East and the heavy shipment to Tidewater. It is also predicted that this will boost the price of other high-grade coals.

There is some improvement noted in the domestic trade. Threshing will not be over until the first of October this season, owing to the wet weather. Some dealers are of the opinion that a car shortage will soon occur as the demand for moving crops will undoubtedly be very heavy and the call for ore cars is becoming insistent. Prices here remain fairly firm.

DETROIT

Slight improvement noted in steam grades. Less coal on demurrage. Lake freighters returning to upper ports light.

Shippers report an improvement in the market for steam coal during the week. Orders are not large and the buyers seemingly have not yet started stocking up, but there is a gratifying number of small orders coming in. There has

been a reduction in amount of coal shipped into Detroit on speculation, much of which usually is forced on the market at prices that have exerted an unsettling influence.

Domestic sizes are rather quiet, neither the retail dealers nor the householders showing any disposition to stock up. A few retail dealers made an effort to increase their stocks of anthracite before the final discount period elapsed with the end of August but the amount of business booked was less than expected.

In the Lake trade the movement is far short of previous years. Freighters which usually take coal on every upbound trip are now going without cargo. The unloading docks on the Upper Lakes carry an unusual quantity of coal because of the belated shipment by rail to interior points.

LOUISVILLE

Larger movement and slight increase in prices. Retail trade weak.

An improvement is noted in the Kentucky market, both as to domestic and industrial grades; this refers principally to the volume moved though the September prices show a slight advance. They are, however, still abnormally low. The retail situation, especially in Louisville, is showing much less strength than usual at this time of year and prices are very low. The mines generally are working at from two-thirds to three-fourths of capacity and the prospects are that full time operations will be the rule soon. Prices rule at from $1.40 for block up to $2.10, and from 25 to 40 and 50 to 65c. for nut and slack, f.o.b. mines.

NEW ORLEANS

Bunker business on the river has now assumed almost normal proportions. The number of ships arriving and leaving this week indicates that there is a healthy resumption of river trade.

COKE

CONNELLSVILLE

Coke market definitely stronger. Sales of prompt furnace at advanced prices and higher figures quoted for forward. Production and shipments make new high record for the year.

Following the removal of some of the pressure in the prompt furnace coke market already reported the market has definitely turned stronger, with sales of prompt coke aggregating between 5000 and 10,000 tons at $1.60, a price which now seems to be the minimum of the market for standard grades. Production has been adjusted more closely to demand, while some of the furnaces that had required shipments on contract to be curtailed are now working better and taking normal tonnages. The continued improvement in the iron and steel market, and particularly the recent advances in pig iron, have encouraged operators to expect considerably higher prices in future.

There is also developing a substantial inquiry for contract furnace coke over the first half of 1916. Definite prices have not yet been quoted but operators feel they should secure more than $2 a ton on such contracts and as they recognize that it is difficult to close contracts at prices very much above the spot market they are disposed to ask higher prices for spot. Foundry coke continues strong while furnace coke is quotable higher on all deliveries, as follows: Prompt furnace, $1.60; September furnace, $1.75; furnace to Jan. 1, $2; prompt foundry, $2.25@2.60; contract foundry, $2.30@2.60, per net ton at ovens.

The "Courier" reports production in the Connellsville and lower Connellsville region in the week ended Aug. 21 at 382,606 tons, an increase of 8193 tons and shipments at 383,628 tons, an increase of 4763 tons. Both production and shipments made new high records for the year.

Buffalo—There is a fair activity in the trade at former prices. An effort to advance the price in this market did not succeed. The tonnage continues considerably larger than formerly and if the situation is in any way indicated by the receipts of iron ore at this port there should be an advance soon. During four of the last days of August the amount was 150,441 tons. Coke prices continue at $4.25 for best 72-hr. Connellsville foundry and $3.30 for stock coke.

Chicago—The demand for all sizes of coke is stronger, and furnace and foundry coke particularly is brisk. There has been a general marking up of prices, and quotations are as follows: Byproduct foundry, $4.90@5.10; byproduct domestic, $4.75; Connellsville, $4.75@4.90; Wise County, $4.75@4.85; gas coke, $3.85@4.

MIDDLE WESTERN

GENERAL REVIEW

Market shows improvement. Domestic buying expanding. Anthracite shows signs of activity. Smokeless demand dull. Screenings steady at last week's prices.

Trade is of moderate proportions and still spotty but shows a slow though perceptible betterment. All grades of domestic coals seem to have a wider market and in steam lines there is increased activity reported. Orders from the country continue in better volume, and these orders call for a great variety of different sizes for immediate shipment. Lack of cash is still the main factor in country districts, accounting for delayed absorption, for which wet weather is much to be blamed. Many farmers depend upon their grain money to buy coal.

A number of Western railroads are making preparations to stock considerable quantities of coal beginning Sept. 1 in anticipation of a suspension in mining operations next spring pending the fixing of a new wage agreement. Some of the Western trunk lines have already started stocking to guard against emergencies.

While shippers in several fields are contemplating further advances in prices next month, averaging 15c. per ton, it is unquestionably true that the orders received so far have not kept pace with the advances already made. The weather turned suddenly cold on Thursday of last week which stimulated storage buying among householders. While a good deal of uncertainty has attended the screenings market recently, prices are now more firm than they were two or three weeks ago, and shipments on contracts are heavier.

Trade via the Lakes is still very slow, and it is the consensus of opinions that there is not much hope for any large movement during the present season. The docks are hoping for relief from congestion when the fall rush of orders begin.

Complaints are made in the Northwestern markets of considerable price cutting. Some of these disrupted prices apply to anthracite, but it is more general in bituminous coals.

A number of mines in the southern part of Illinois, and in the Springfield and Peoria districts, which have been closed since last spring, are reopening. The C. & A. Ry. has placed orders to rush all hopper-bottom cars now on storage tracks needing repairs to their Bloomington shops, so that they may be put in serviceable condition for hauling coal upon the arrival of colder weather.

CHICAGO

General advance in price schedules effective Sept. 1. Shipments in a larger volume. Smokeless weak. Good month-end demand for anthracite but prices remain low.

It is reported that most of the Illinois operators will increase list prices Sept. 1. Franklin County shippers will ask $1.75 for the coarse sizes, Williamson County the same, and others are expected to name a minimum $1.60 for lump and egg, and $1.75 for No. 1 washed. This prospective advance and increase in freight rates has caused a rush of business to the Franklin and Williamson County mines during the past week. Screenings are slightly easier, having declined on an average of 5c. per ton. Saline County operators expect to advance coarse sizes to $1.65 Sept. 1.

While Springfield operators are considering an increase in the circular, there is a good deal of doubt that this movement will be a concerted one. Steam and domestic coals have been stronger and screenings are about the same.

Shipments from the Clinton field have been in larger volume for domestic sizes, and it is said that the operators will advance prices 10c. per ton Sept. 1. The Knox County operators are still devoting most of their efforts to producing steam coal which averages them 80c. per ton. The demand for Sullivan County coal is not improving as fast as elsewhere, although it is understood the operators will ask higher prices for Nos. 5 and 6 coal beginning Sept. 1. The Sullivan County mines are operating about three days per week, and most of their coal is being shipped to Indianapolis and the Gas Belt.

Smokeless mine-run is moving plentifully at $1.25, and the lower prices for August shipment have not so far been the means of stimulating the market to any extent. Smokeless shippers expect to return to the $1.40 basis on mine-run Sept. 1. Country shipments have improved, and no accumulation of prepared sizes has occurred. Pocahontas and New River lump is being readily absorbed at prices ranging from $2.10 to $2.15, and egg at from $1.90 to $2.25; the market has been more quiet than shippers anticipated.

Hocking coal has been in good demand for harvesting purposes, and prices have been firmly held. It is rumored that 1¼-in. lump will advance on Sept. 1 to $1.60.

Some little improvement is noted in the market for Kentucky coals. Apparently the demand from Southern points has increased, with the result that not so much free coal is thrown on the northern markets at low prices.

The demand for anthracite toward the close of August was stronger especially for chestnut. Considerable independent anthracite is still being sold under circular prices, notwithstanding the rate advance. Householders in Chicago have absorbed considerable quantities of anthracite of various sizes in the last ten days.

Quotations in the Chicago market are as follows:

	Williamson and Franklin Co.	Springfield	Sullivan	Clinton	Knox and Greene Cos.
Lump	$1.50@1.60	$1.35@1.50	$1.35@1.50	$1.25@1.50	$1.40@1.50
Steam lump	....	1.15@1.25	1.15@1.30	1.15@1.25	1.15@1.30
2½ and 3-in. lump	....	....	1.25@1.35	1.25	....
1¼-in. lump	1.25	1.25	1.20@1.25	1.15@1.25	....
Egg	1.40@1.60	1.35@1.50	1.15@1.25	1.25@1.35	1.15@1.30
Nut	....	1.25@1.35	1.00@1.10	1.00@1.10	1.00@1.25
No. 1 washed	1.45@1.60	....	1.45@1.50	....	....
No. 2 washed	1.35@1.45	....	1.40	....	....
No. 1 nut	1.40@1.60	....	....	....	....
No. 2 nut	1.30@1.40	....	....	....	....
Mine-run	1.05@1.10	1.00@1.10	.85@ .95	.95@1.10	.85@1.05
Screenings	.65@ .75	.65@ .75	.60@ .75	60@ .75	.75

	Harrisburg & Saline Co.	E. Kentucky	Pocah. & W.Va.Smok'l.	Penna. Smokeless	Hocking
Lump	$1.35@1.50	$1.35@1.90	$2.15@2.25	$1.75@2.00	$1.40@1.60
1¼-in. lump	1.25@1.30	1.25@1.50	....	1.25@1.35	1.25@1.35
Egg	1.35@1.50	1.25@1.35	2.15@2.25	1.75@2.00	1.25@1.35
Nut	....	1.00@1.15	1.75	1.25@1.40	1.15@1.25
No. 1 nut	1.35@1.50	....	....	....	....
No. 2 nut	1.25@1.35	....	....	....	....
Mine-run	1.10	.85@1.00	1.15@1.40	1.15@1.25	1.15
Screenings	.65@ .70	.50@ .65	....	....	....

ST. LOUIS

Severe floods have seriously interfered with the movement. Cool weather stimulates the demand and prices are firm.

Floods during the past week hindered the movement of coal to the St. Louis market and sent the price of lump up 5c. and that of screenings 10c.; the latter, however, lost half of the increase before the end of the week. There were washouts on nearly all the roads entering St. Louis and for several days there was no coal arriving. Local coal yards were submerged and could make no deliveries. The Terminal Railway Association had difficulty in handling the coal that was on tracks before the flood came.

The prices on anthracite for September shipment to East St. Louis and St. Louis are as follows: Chestnut, $7.55; egg, $7.30; stove, $7.30; grate, $7.05. The rate of $4.25 gross ton applies.

The cool weather has caused an increased demand for domestic coal and prices are ruling very firm on all sizes. Screenings have been well maintained during the week. The indications are that Sept. 1 will bring a marked advance in all domestic sizes.

Quotations are as follows:

	Franklin Co.	Williams Co.	Staunton	Sparta	Standard
6 in. lump	$1.50@$1.65	$1.40@$1.50	$1.30	$1.20	$1.10@1.15
3 in. lump	....	....	1.20	....	....
2 in. lump	....	....	....	1.00	.95
Egg	1.50@ 1.60	1.25@ 1.40	....	1.00	.90@ .95
No. 1 nut	1.50@ 1.60	....	....	....	.90
No. 2 nut	1.25@ 1.35	....	....	....	....
No. 1 washed	....	1.50@ 1.60	1.50	....	....
No. 2 washed	....	1.40	1.35	....	....
No. 3 washed	....	1.25	1.25	....	....
No. 4 washed	....	1.20	1.15	....	....
No. 5 washed	....	.75@ .80	.80	....	....
Segs	....	.55@ .60	....	.55@ .60	.55@ .60

The above prices are f.o.b. mine, Franklin and Williamson County coal rate to St. Louis being 72½c. per ton and the balance 57½c. per ton. Rates to East St. Louis, Madison and Granite City, Ill., are 25½c. lower.

INDIANAPOLIS

Shortage of gondola cars for first time this year. Movement of domestic lump continues to improve.

Operators are experiencing their first pinch this season in the way of a shortage of gondola cars. The trouble is mainly on the Vandalia lines which carries a large percentage of the output of the Indiana mines. The demand for domestic lump improves as the season advances. August, which is usually the hottest month, was unusually cool this year which made it necessary to buy some coal and served as a strong reminder that the coal season is rapidly advancing.

Operators have no trouble in disposing of screenings. No. 4 commands 90c. f.o.b. mines and No. 5 80c. It is said some No. 5 is being offered at 75c. but this is a low-grade product. With the opening of September retailers are beginning to get a little busier. Their prices remain unchanged.

PRODUCTION AND TRANSPORTATION STATISTICS

BITUMINOUS COAL MOVEMENT

The following is a summary of the movement of coal and coke over 13 principal railroads during May and the first five months of the last two years, in short tons:

	May		5 Months	
Anthracite	1914	1915	1914	1915
Baltimore & Ohio[1]	97,003	93,698	633,765	526,828
Chesapeake & Ohio[1]	1,270	1,367	6,224	4,990
Erie[2]	787,238	683,542	3,642,083	3,420,471
Pennsylvania[1 3]	1,022,077	972,995	4,799,030	4,580,414
Virginian[2 1]	.....	145	52	342
Total 5 roads	1,907,588	1,751,747	9,081,154	8,533,045
Bituminous				
Baltimore & Ohio[1]	2,488,515	2,723,221	13,716,728	11,730,282
Buffalo, Roch. & P.[1 2]	466,455	633,175	3,309,135	3,012,460
Buffalo & Susq.[1 2]	43,125	81,162	490,772	437,829
Chesapeake & Ohio[1]	1,821,011	1,911,315	7,849,046	8,093,417
Erie[3]	4,262	10,432	32,683	45,328
Hunt. & Br'd T. Mt.[1 2]	59,043	71,376	466,219	393,776
New York Central[3]	492,619	672,041	3,318,606	3,500,634
Norfolk & Western[1 2]	2,338,672	2,434,614	10,200,365	10,047,876
Pennsylvania[1 3]	3,543,218	3,393,328	19,657,638	16,597,074
Pitts. & Lake Erie[1 2]	957,528	954,946	4,482,749	3,339,253
Pitts. Shaw. & North[1 2]	152,807	152,640	1,016,809	899,733
Virginian[1 2]	359.879	307,006	1,706,539	1,596,739
Western Maryland	187,228	266,763	1,301,792	1,344,024
Total 13 roads	12,914,362	13,612,019	67,549,081	61,038,425
Coke				
Baltimore & Ohio[1]	301,163	297,897	1,541,624	1,297,871
Buffalo, Roch. & P.[1 2]	21,175	33,662	118,397	166,803
Buffalo & Susq.[1 2]	8,643	49,259	129,509	244,213
Chesapeake & Ohio[1]	31,040	21,803	178,363	87,343
Norfolk & Western[1 2]	88,145	79,270	492,747	366,766
Pennsylvania[1 3]	817,816	872,181	4,434,422	4,008,443
Pitts. & Lake Erie[1 2]	428,395	427,333	2,299,069	1,791,030
Western Maryland	5,058	4,497	34,504	17,489
Total 8 roads	1,701,435	1,785,902	9,228,635	7,979,958

Total Coal and Coke 13 Roads	1914	1915
January	18,157,998	15,685,798
February	15,446,830	13,702,789
March	20,233,213	14,943,124
April	15,497,444	16,070,049
May	16,523,385	17,149,668
Total, 5 months	85,858,870	77,551,428

[1] Includes coal received from connecting lines.
[2] Includes company's coal.
[3] Does not include company's coal hauled free.

Note:—The Southern Railway hauled 274,122 short tons of bituminous coal during April, 1915, and 1,093,804 short tons during the four months ending Apr. 30.

IMPORTS AND EXPORTS

The following is a comparative statement of coal imports and exports of the United States for June, 1914-15, and for the twelve months ending June, 1913-14-15, in long tons:

	June		Twelve Months		
Imports from:	1914	1915	1913	1914	1915
United Kingdom	341	.....	9,398	11,025	33,919
Canada	67,511	85,525	1,336,387	1,005,693	1,121,810
Japan	1,838	11,750	79,072	85,689	89,240
Australia and Tasmania	21,896	21,094	150,150	251,977	182,041
Other countries	5	350	3,257	3,618	2,598
Total	91,591	118,719	1,578,264	1,358,002	1,429,608
Exports:					
Anthracite					
Canada	427,719	352,234	4,545,965	3,897,365	3,621,234
Uruguay	.....	5	.....	84	5
Other countries	5,546	397	79,505	61,665	60,949
Total	433,265	352,636	4,625,481	3,959,114	3,682,188
Bituminous					
Italy	.....	383,019	.....	.....	1,628,279
Canada	793,856	873,239	11,981,443	11,472,397	8,425,103
Panama	25,810	47,708	483,974	362,427	343,372
Mexico	15,866	22,445	443,884	296,392	391,611
Cuba	81,575	74,984	1,273,945	1,129,954	1,065,206
West Indies	45,433	48,406	601,431	577,541	461,892
Argentina	9,977	157,831	.....	139,409	563,889
Brazil	10,023	122,484	.....	239,082	527,264
Uruguay	6,200	11,968	.....	62,452	103,639
Other countries	196,826	191,326	1,298,424	1,425,312	902,740
Total	1,185,566	1,933,410	16,083,101	15,704,966	14,412,995
Bunker coal	868,736	727,808	7,351,114	7,811,913	7,062,653

I. C. C. DECISION

I. C. C. No. 5638—Plymouth Coal Co., vs. Delaware, Lackawanna, and Western R.R. Co.

Defendant's demurrage regulations governing anthracite coal awaiting transshipment at or near tidewater at Hoboken, N. J., found reasonable.

Coal Contracts Pending

The purpose of this department is to diffuse accurate information of prospective purchases and prices with a view to affording equal opportunity to all, promoting market stability and inculcating sound business principles in the coal trade.

For the official advertisements of bids wanted see the Contracts-to-Be-Let Section on Page 36.

✚Indicates contracts regarding which official information has been received.

Recast

In the following table we give a list of all old contracts coming up for consideration during the ensuing week. The table gives our contract number, the name of the purchaser, city, tonnage and page on which the detail notice appeared.

No.	Purchaser	City	State	Tonnage	Page
1253	Bd. of County Comrs.	Stanley	N. D.		323
1257	Bd. of County Comrs.	Watertown	S. D.	90b	323
1278	Bd. of County Comrs.	Bloomington	Ind.	100b	324
1286	Cass County Bd. of Comrs.	Fargo	N. D.		324
1287	Bd. of County Comrs.	Greensburg	Ind.	175b	324
1290	Dickey County Bd. of Comrs.	Ellendale	N. D.	200b	325
1321	Bd. of County Comrs.	Plymouth	Ind.	280b	361
1322	Bd. of County Comrs.	Brownstown	Ind.		367

a Indicates anthracite coal. b Indicates bituminous.

Supplemental Notes

Under this heading additional or supplemental information regarding old contracts appears, together with the page number of the original notice.

1012—Pleasant Hill, Mo.—This contract (pp. 77, 243), which provides for furnishing the George M. Kellogg, Flower & Plant Co. with approximately 100 cars of coal per season has been bid on for southern Kansas, as follows: Slack, $1.35; mill, $1.50; mine-run, $1.75; nut, $1.85; screened lump, $2. Address Pur. Agt. N. F. Parker, George M. Kellogg Flower & Plant Co., Pleasant Hill, Mo.

✚**No. 1032—Cleveland, Ohio**—The following is a list of bids on this contract (pp. 115, 323), which provides for furnishing the local Board of Education with coal:

Firm	300 Hard	3000 Lump	2500 Nut	25,000 Slack	4000 Mine-Run	4000 Lump
Albright Coal Co.	$6.86	$3.15	...	...	$3.72	$4.34
	7.11	...	...	...	3.62	4.24
	...	...	...	...	3.52	...
	...	...	...	...	3.25	...
Cuyhago Coal Co.	6.87	3.15	...	$2.65	3.47	4.72
	6.87	2.75	$2.44	2.05	3.45	4.72
	7.09	...	...	2.50	3.43	4.72
Cleveland & Pittsburgh Coal Co.	7.25	2.79	2.64	2.49	3.50	4.60
Goff-Kirby Coal Co.	6.68	2.85	2.65	2.55	3.23	4.08
	6.91	2.92	...	...	3.33	4.07
	...	...	...	2.15	3.44	4.45
	...	...	...	...	3.59	3.85
Zettelmeyer Coal Co.	...	...	...	2.30	...	3.90
	...	...	...	...	...	3.95
	...	...	...	2.40	...	...
	...	...	...	2.37½	...	...

The contract has not yet been awarded. Address Dir. of Schools F. C. Hogen, School Headquarters, Rockwell Ave. and East Sixth St., Cleveland, Ohio.

✚**1090—Columbus, Ohio**—No award has yet been made on this contract (pp. 117, 366), which provides for furnishing the various city departments with coal. Bids of West Virginia operators were lower, but there is a great deal of pressure being exerted to force the contract to Ohio operators. Address Clk. Paul B. Kemper, Pub. Service Com., Columbus, Ohio.

1200—Cincinnati, Ohio—Bids have been received on this contract (p. 244), which provide for furnishing the local Water Works Department with coal as follows: Reliance Coal Co., Filtration Plant, $2.21 per ton; Consolidation Coal Co., Western Hills, $1.99 per ton; Campbells Creek Coal Co., Main Station, 5.875c. per bu. in barge lots, and $2.15 per ton delivered by gawon. Address Asst. Secy. C. A. Zech, Pub. Service, City Hall, Cincinnati, Ohio.

1252—Minot, N. D.—All the bids on this contract (p. 284), which provides for furnishing the schools of the Burlington School District No. 7, with coal have been rejected and the call for bids will be readvertised. Bids were received from J. S. Wallace and the City Coal Co. Address Clk. W. E. Gross, Burlington School Dist. No. 7, Minot, N. D.

✚**1301—Pewee Valley, Ky.**—Bids on this contract (p. 366), which provides for furnishing the Confederate Home with mine-run, lump and nut coal will be received until Sept. 5. Bids will be considered only on good steam making coal, and are to provide for delivery as required. Address Commandant Henry George, Confederate Home, Pewee Valley, Ky.

New Business

✚**1332—Webster City, Iowa**—The Board of Education will receive sealed bids until 5 p.m., Sept. 6, for furnishing from 700 to 900 tons of 3-in. Iowa steam coal, and 100 to 300 tons of Iowa lump or 6-in. egg coal. Bids are to include cost of delivery to the school buildings as required. Address Secy. J. M. Blake, Bd. of Edu., Webster City, Iowa.

1333—Edgeley, N. D.—Bids will be received until Sept. 7 for furnishing the High School with lignite coal as may be required during the ensuing year. Bids should include cost of delivery in the basement of the school in carload lots. Address Clk. Ernest Steel, Bd. of Edu., Edgeley, N. D.

✚**1334—Parker, S. D.**—Sealed bids will be received until 1 p.m., Sept. 8, for furnishing Turner County with approximately 100 tons of the best Virginia lump coal. Address County Audr. O. M. Rasmussen, Parker, S. D.

✚**1335—Moberly, Mo.**—The Board of Public Works will receive bids until noon, Sept. 3, for furnishing the city waterworks with coal until Apr. 1 of next year. Bids are requested on both mine-run and lump coal, to be delivered in the coal bunkers and storage shed at the plant. Address Supt. C. H. Chamblin, Bd. of Pub. Wks., 212 No. William St., Moberly, Mo.

1336—Washington, Ind.—The Board of County Commissioners at this place will receive bids until Sept. 7 for furnishing a year's supply of mine-run, lump and nut coal. Address County Audr. Lew C. Core, Bd. of County Comrs., Washington, Ind.

✚**1337—Wilmington, Del.**—The United States Engineer's Office will receive bids until 11 a.m., Sept. 8, for furnishing 3000 tons of bituminous coal. Complete details may be had on application. Address, United States Engineer's Office, Old Federal Bldg., Wilmington, Del.

✚**1338—Jackson, Miss.**—The Board of Supervisors of Hinds County, Miss., will receive bids until Sept. 6 for furnishing 140 tons of No. 2 lump coal to be delivered in the basement of the courthouse and jail, and also one car of No. 1 lump, f.o.b. Raymond. Address Chancery Clk. W. W. Downing, Hinds County Bd. of Supervisors, Jackson, Miss.

✚**1339—Cleveland, Ohio**—The Board of Public Service will receive bids until noon, Sept. 9, for furnishing coal to be used at the garbage reduction plant. Complete details may be had on application. For previous notice in regard to this contract see No. 50, Vol. 7, p. 149. Address Dir. A. A. Benesch, Pub. Service Dept., 204 City Hall, Cleveland, Ohio.

1340—Livingston, Mont.—The Board of County Commissioners will receive bids until 10 a.m., Sept. 9, for furnishing approximately 200 tons of lump coal to be delivered as required at the County Court House and jail. The contract will run for one year. A certified check for $200 must accompany each bid. Address County Clk. Chas. A. Burg, Bd. of County Comrs., Livingston, Mont.

✚**1341—Great Falls, Mont.**—Bids will be received by school district No. 1 until 4 p.m., Sept. 7, for furnishing coal as required by the local schools during the ensuing year. Bids must be accompanied by a certified check for $100, and the successful bidder will be required to furnish a satisfactory bond for $1000 guaranteeing the faithful performance of the contract. Address Clk. H. A. Cary, School Dist. No. 1, Great Falls, Mont.

1342—Boone, Iowa—The Independent School District at this place will receive bids until 3 p.m., Sept. 9, for furnishing and delivering the best grade lump coal as may be required at the several school buildings in the district during the

ensuing year. Address Secy. R. T. Duckworth, Independent School Dist., Boone, Iowa.

1343—Brazil, Ind.—The Board of County Commissioners at this place will receive bids until Sept. 7 for furnishing coal as may be required during the ensuing year. Address County Audr. W. O. Graeser, Bd. of County Comrs., Brazil, Ind.

✚1344—Irene, S. D.—The County Commissioners will receive bids until 2 p.m., Sept. 7, for furnishing the best screened Hocking Valley coal for the County Court House and jail, during the period beginning September of this year, and ending April of next year. Address County Audr. W. O. Nelson, Bd. of County Comrs., Irene, S. D.

✚1345—Rich Hill, Mo.—The Board of Education at this place will receive bids until noon, Sept. 7, for furnishing the city with approximately 4000 bu. of coal to be delivered in the bins of the various school buildings as may be directed. Address Secy. L. C. Stonebraker, Bd. of Edu., Rich Hill, Mo.

1346—Magnolia, N. J.—The local Board of Education will receive bids until 8 p.m., Sept. 8, for furnishing one carload of the best stove coal for each of the public schools on Lincoln and Adams Ave. The carloads are to contain from 25 to 30 gross tons. A certified check for one-fifth of the contract price must accompany all proposals. Address District Clerk, Bd. of Edu., Magnolia, N. J.

1347—Sullivan, Ind.—The Board of County Commissioners will receive bids until Sept. 7, for furnishing the year's supply of coal. Address County Audr. W. S. Bicknell, Bd. of County Comrs., Sullivan, Ind.

✚1348—Brookville, Ind.—The Franklin County Board of Commissioners will receive bids until Sept. 6 for furnishing coal as required in the county institutions during the ensuing year. Address County Audr. R. C. G. Reisel, Brookville, Ind.

✚1349—Ogden, Utah—The Board of Education at this place usually contracts about Oct. 1 for their annual fuel requirements involving approximately 1400 tons of screened slack coal. The business last year was done at $2.85 per ton delivered at the schools or $2.70 f.o.b. Castle Gate coal is being used on the present contract. Address Bd. of Edu., Hudson Bldg., Ogden, Utah.

✚1350—Bluffton, Ind.—The Wells County Board of Commissioners received bids until Aug. 28 for furnishing coal as required at the county institutions during the ensuing year. Address Board of County Commissioners, Wells County, Bluffton, Ind.

✚1351—Fowler, Ind.—The Benton County Board of Commissioners will receive bids until Sept. 6 for furnishing 140 tons of anthracite egg coal and 10 tons of bituminous coal to be used at the county institutions during the ensuing year. Address County Audr. Warren Mankey, Bd. of County Comrs., Fowler, Ind.

1352—Kansas City, Mo.—The Security Stove Co. at this place will buy approximately four cars of bituminous coal about Oct. 1. Address H. E. Blakeslee, Security Stove Co., 17th St. and Oakland Ave., Kansas City, Mo.

1353—Petersburg, Ind.—The Pike County Board of Commissioners will receive bids until Sept. 7 for supplying coal required at the poor asylum and county jail during the ensuing year. Address County Audr. John D. Gray, Bd. of Comrs., Petersburg, Ind.

✚1354—Albany, N. Y.—The State Hospital will receive bids until 10:30 a.m., Sept. 8, for furnishing the Buffalo State Hospital for the Insane with coal during the six months' period beginning Oct. 1. The hospital requires 25,000 to 30,000 tons per year. Address Purchasing Committee, State Hospital, Room 138, Capitol, Albany, N. Y.

1355—New Orleans, La.—The St. Charles Hotel at this place is requesting bids on their fuel requirements for the ensuing year. Address Secy. Treas. S. A. Trufant. A. S. Amer & Co., St. Charles Hotel, New Orleans, La.

✚1356—Storm Lake, Iowa—The Municipal Light and Water Department at this place will contract about Oct. 1 for their annual requirements of coal involving approximately $5700 worth. The coal last year cost $3.54 per ton placed in the bins for 6-in. Iowa lump. Address President Edgar E. Mock, Municipal Light & Water Dept., Storm Lake, Iowa.

✚1357—New Kensington, Penn.—The School District will receive bids until 8 p.m., Sept. 10, for furnishing mine-run, lump, nut and slack coal as may be required during the ensuing year. Address Secy. B. F. Davis, School Bd., New Kensington, Penn.

1358—Louisville, Ky.—The Peter & Burghard Stone Co. will contract about Oct. 1 for their annual fuel requirements involving approximately 40 carloads. Delivery will be by wagon, and the grade and quality desired will be decided upon later. Address Peter & Burghard Stone Co., 810 S. 13th St., Louisville, Ky.

1359—Chippewa Falls, Wis.—The County Government will receive bids for furnishing and delivering coal as required during the ensuing year at the County Court House and jail. Bidders must specify the heat value of the coal they propose furnishing. Address Chn. Jos. Nolte, County Court House, Chippewa Falls, Wis.

✚1360—Hannibal, Mo.—The Board of Public Works usually contracts about Oct. 1 of each year for their annual fuel requirements involving approximately 12,000 tons of slack coal. The current contract was negotiated at $1.34 per ton f.o.b. tracks at Hannibal. Address Board of Public Works, Hannibal, Mo.

1361—Davenport, Iowa—The Moline Rock Island Manufacturing Co. and the Tri-City Railway & Light Co. usually contract for their annual fuel requirements about Oct. 1. The combined companies consume approximately 75,000 tons of 1¼-in. screening per year. The business is done on competitive bids. Address G. W. Kuhn, Moline Rock Island Co., Davenport, Iowa.

✚1362—Hopkinsville, Ky.—The Christian County Board of Education is receiving bids for approximately 10,000 bu. of lump coal to be delivered as required during September and October. Address Superintendent, Christian County Board of Education, Hopkinsville, Ky.

✚1363—Berg, N. D.—The Grail School District will receive bids until Sept. 7 for furnishing the local schools with coal as may be required during the ensuing year. Address Clk. A. L. Rothie, Grail School Dist., Berg, N. D.

✚1364—Traverse City, Mich.—The Traverse City State Hospital will receive bids until 5 p.m., Sept. 7, for furnishing approximately 7000 tons of a bituminous coal suitable for automatic chain grate stokers; 5000 tons is to be delivered as directed before Jan. 1, and the balance before Apr. 1, 1916. Bidders should specify the grade of coal they propose furnishing and the price f.o.b. track Traverse City, Mich. All bids must be accompanied by an analysis of the coal. Address Steward George B. Pike, Traverse City State Hospital, Traverse City, Mich.

Contracts Awarded

Note—Successful bidders are noted in **bold face** type.

No. 793—Atlanta, Ga.—This contract (Vol. 7, p. 1005), which provides for furnishing the Georgia Railway & Power Co. with coal for its gas department, has been awarded to the **Harland Coal Co.**, of Pineville, Ky. About 10,000 tons of gas coal will be delivered on the contract this fall. The price has not been made public. Address Mgr. Richard C. Congdon, Georgia Railway & Power Co., Gas Department, Atlanta, Ga.

✚No. 873—Springfield, Mo.—This contract (Vol. 7, p. 1086, Vol. 8, p. 233), which provides for furnishing the Board of Education with approximately 1400 tons of screened Kansas lump coal, has been awarded to the **Springfield Coal, Ice & Transportation Co.**, its bid being considered the lowest and best. Address Secy. Edward J. Hoffman, Bd. of Edu., Springfield, Mo.

No. 922—New Orleans, La.—This contract (Vol. 7, p. 1127, Vol. 8, pp. 157, 246), providing for the fuel requirements of the School Board at this place, was awarded to the **W. G. Coyle Coal Co.**, of New Orleans, whose bid was $3.85 per ton for more than 1000 tons of bituminous and $8.35 and $8.45 for 500 tons of egg, and stove and nut, respectively. Proposals were received as follows:

Coal	Volitile	B.t.u.	Price
Cahaba Red Ash Co.....(Galloway)	34.96	12,856	$3.60
Jung & Sons Co..... (Illinois)	37.28	13,460	4.19
Jung & Sons Co..... (Black Creek)	32.56	15,170	4.37
C. A. Andrews Co..... (Corbon Hill)	....	13,250	3.90
C. A. Andrews Co..... (Sipsey)	....	14,500	3.95
Darsam Bros. Co..... (Ajax)	34.21	13,750	3.90
Darsam Bros. Co..... (Nut)	33.21	13,400	3.75
Tenn. Coal & Iron Co.....(Cahaba)	35.88	14,250	3.82
Pittsburg Co.....(Corbon Hill)	32.50	13,000	3.75
W. G. Coyle & Co......(Sipsey)	34.11	14,500	3.85
Robert B. Hyams....(Rodin Cahaba)	34.00	14,500	3.85
Robert B. Hyams .....(Corona)	....	13,500	3.40

Anthracite—

W. G. Coyle & Co. (egg).....	$8.35
W. G. Coyle & Co. (stove and nut).....	8.45
C. A. Andrews & Co. (egg and stove).....	8.60
Darsam Bros. Co. (egg).....	8.75
Tennessee Coal & Iron Co. (egg and stove).....	8.32
Pittsburg Coal Co. (egg and stove).....	8.50
Pittsburg Coal Co. (nut).....	8.75
Robert P. Hyams Coal Co.....	8.75

Address Purchasing Agent, New Orleans School Board, flourth floor, Municipal Bldg., New Orleans, La.

✚No. 960—Harriman, Tenn.—This contract (p. 41), which provides for furnishing the Harriman Water and Light De-

partment with its coal requirements during the ensuing year, involving approximately 2160 tons of coal, has been let to **Church & Co.** Address R. Walzl, Harriman Water and Light Department, Harriman, Tenn.

1057—Superior, Wis.—This contract (p. 116), which provides for furnishing the Board of Education with its annual supply of coal, involving approximately 2500 tons of lignite, has been awarded to the **Donley Dray & Storage Co.** at $2.89 per ton. There were 15 other bidders on this business, all of whom quoted $3.50 per ton. Address Secy. L. A. Nichols, Bd. of Edu., Superior, Wis.

✚1070—Ashtabula, Ohio—As previously noted, this contract (pp. 117, 325), which provides for furnishing the local Board of Education with coal and water, has been awarded to the **Ashtabula Coal Co.** at $2.58 per net ton delivered. Bids were received on the contract as follows: Crystal Ice Co., Oakdale, $2.62½ per ton, Moon Run $2.62½, Bessemer $2.30, thick vein $2.55; M. C. Robinson, Oakdale, $2.60, Clifton $2.50, Moon Run $2.70, Prior Penobscot $2.40; F. C. Horton, not specified, $2.53; Aten Coal Co., Oakdale, $2.75; **Ashtabula Coal Co.,** Oakdale, $2.58; not specified, $2.52. Address Clk. Charles E. Peck, Bd. of Edu., Ashtabula, Ohio.

✚1089—St. Louis, Mo.—This contract (p. 117), which provides for furnishing the Water-Works Department with approximately 34,000 tons of egg coal and 37,000 tons of screening, has been awarded to **Donk Bros. Coal & Coke Co.** at the prices noted in the accompanying table. Complete list of bids received, including cost of delivery with the freight rate of 57½c. per ton, was as follows:

	Lump	Egg	Screenings
Donk Bros. Coal & Coke Co....	$1.47	$1.44	$1.13½
St. Louis & O'Fallon Coal Co...	1.72½	1.77½	1.37½
Southern Coal, Coke & Min. Co.	1.62½	1.62½	1.32½
Polar Wave Ice & Fuel Co.....	.....	1.52½	1.27½
Boehmer Coal Co.....	1.55½	1.54½	1.14½

Address Board of Water Commissioners, St. Louis, Mo.

1099—Jefferson City, Mo.—The State Commissioners of Missouri have awarded to **John W. Riner,** of Jefferson City, the contract for furnishing coal to the various state departments for the fiscal year beginning Oct. 1 (p. 157). His bid was $2.89 a ton f.o.b. Missouri Pacific cars at Jefferson City. The specifications called for No. 2 Carterville washed nut coal or its equivalent. The Southern Coal, Coke & Mining Co., St. Louis, offered to supply Southern Sootless No. 2 at $2.65. The other bids were as follows: Bald Eagle Mining Co., St. Louis, $2.95; West Virginia Coal Co., St. Louis, $2.92½; J. C. Johnson, Jefferson City, $3; Peabody Coal Co., Chicago, $3; Devoy & Kuhn Coal Co., St. Louis, $2.97; Chicago, Wellington & Franklin Coal Co., Chicago, $2.95. The contract was let last year at $2.97½. Address Secy. Cornelius Roach, Com. of Gov., Jefferson City, Mo.

1101—Urbana, Ohio—This contract (p. 157), which provides for furnishing the county commissioners with coal, has been awarded to the **Gaumer Coal Co.** Address County Audr. O. E. Eby, Bd. of County Comrs., Urbana, Ohio.

✚1108—Sharpsville, Penn.—This contract (p. 157), which provides for furnishing the local School Board with 150 to 200 tons of coal, has been awarded to **C. B. Kantner** at $2.35 per ton for Pittsburgh ¾-in. screenings. Coveret & Stewart bid $2.38 and Eckles & Boyd $2.35 for the same fuel. Address Secy. H. B. Wert, Sharpsville Dist. School Bd., Sharpsville, Penn.

✚1111—St. Joseph, Mo.—This contract (p. 157), which provides for furnishing the local Board of Education with approximately 4000 tons of coal, has been awarded to the **Central Coal & Coke Co.** at $3.10 per ton for 1¼-in. shaker screen coal fro... Beaver, Mo. The cost includes delivery to schools. This contract last year was filled at $3.17 per ton. There were eight other bids on the business. Address Secy. A. L. Loving, Bd. of Edu., St. Joseph, Mo.

✚1112—Natrona, Penn.—This contract (p. 157), which provides for furnishing the Harrison Township School Board with coal, has been awarded to **Edward Koenig,** at 8c. per bu. for nut coal. Address Secy. Percy M. Kennedy, Natrona, Penn.

✚1117—Rockville, Ind.—This contract (p. 158), which provides for furnishing the local School Board with approximately 5000 bu. of coal, has been awarded to **Henry Kinney,** at $2.20 per ton for 4-in. screened coal. Address Secy. O. M. Teague, Bd. of Edu., Rockville, Ind.

1120—New Orleans, La.—This contract (p. 158), which provides for furnishing local school board with its coal requirements during the ensuing year, has been awarded to **W. G. Coyle & Co.,** of this city, at $3.85 for bituminous and $8.35 to $8.45 for anthracite. Address Secy. E. A. Williams, Bd. of Edu., Municipal Bldg., Carondelet & Lafayette St., New Orleans, La.

Contract Notes

Globe, Ariz.—The contract for furnishing the Copper Queen Mining & Milling Co. with 200 tons of coke per day has been awarded to the **Victor American Fuel Co.**

Louisville, Ky.—The Peerless Mfg. Co. at this place consumes from four to six cars of bituminous nut and slack per month. Deliveries are made by railroad and they have a storage capacity of two cars.

Rumford Falls, Me.—The several mills of the International Paper Co., at this place, are substituting oil for coal, the first cargo of oil having already arrived. Other paper mills in this vicinity are expected to follow suit.

Hampton Roads, Va.—Among contracts recently closed here was one for supplying the interned German cruiser "Wilhelm" with about 1000 tons which is to be used for cooking purposes, refrigeration, etc., while the ship is at the dock.

Pawtucket, R. I.—The contract for the Lorraine Mfg. Co., involving 12,000 tons of New River and buckwheat coal per annum (p. 246) should have stated that deliveries were at the rate of 1000 tons per month instead of 100 tons. Address, W. H. Jollie, Lorraine Mfg. Co., Pawtucket, R. I.

Philadelphia, Penn.—The North Bros. Co., consumes about 50 tons of bituminous coal per month. Deliveries are made by railroad, and they have a storage capacity of 300 tons. Address, Purchasing Agent, North Bros. Manufacturing Co., Lehigh Ave. and American St., Philadelphia, Penn.

Saginaw, Mich.—The Arlington & Curtis Mfg. Co., at this place, consumes about 45 tons of mine-run coal per month. Deliveries are made by railroad and wagon, and mine-run coal from Saginaw mines is used. Address, Purchasing Agent, The Arlington & Curtis Mfg. Co., Holden, Saginaw, Mich.

Philadelphia, Penn.—The Sanquirt Silk Mfg. Co. consumes about 3500 tons of No. 2 buckwheat per annum. Their storage capacity is 1000 tons and the deliveries are made by railroad at the rate of 250 to 300 tons per month. Address Pur. Agt. L. G. Schlehner, 4015 Clarissa St., Philadelphia, Penn.

Tacony, Penn.—The Ross-Tacony Crucible Co. of this place consume about 100 tons of bituminous, 1100 tons broken and 300 tons buckwheat coal per annum. They have a storage capacity of 200 tons and deliveries are made by railroad. Address Purchasing Agent, Ross-Tacony Crucible Co., Tacony, Penn.

Philadelphia, Penn.—The Quaker City Flour Mills consume approximately 7500 tons of buckwheat coal per annum. Deliveries are made by railroad, and their storage capacity is 300 tons. They have no specific time for contracting. Address, Pur. Agt. L. G. West, Fourth and Market St., Philadelphia, Penn.

St. Bernard, Ohio—The M. Werk Co. at this place consume from 5000 to 6000 tons of nut and slack coal per annum. Deliveries are made by railroad at the rate of 100 to 150 tons per week, and they have a storage capacity of 200 tons. Address Pur. Agt. A. G. Schwartz, care of The M. Werk Co., St. Bernard, Ohio.

Philadelphia, Penn.—The Philadelphia Sash Weight Works at this place consume about 50 tons of anthracite pea and 100 tons of 72-hr. Connellsville coke per annum. They have a storage capacity of 80 tons and the coke is delivered at the rate of 21 tons per week via the Pennsylvania R.R. Address Purchasing Agent, Philadelphia Sash Weight Works, 22nd and Glenwood Ave., Philadelphia, Penn.

New Orleans—The contract for furnishing the New Orleans Custom House with coal for the fiscal year ending June 30, 1916, was awarded at $3.15 per long ton. As noted in the previous issue (p. 246), the contract went to the **Robt. P. Hyams Coal Co.** Other bidders on the contract were: Tennessee Coal, Iron & R.R. Co., $3.38; Jung & Sons Co., $3.38; C. A. Andrews Coal Co., Ltd., $3.25; Pittsburgh Coal Co., $5.65. The contract involves approximately 1200 long tons and the successful bidder agreed to furnish coal having a B.t.u. value of 13,800 "as received." Address, the New Orleans Custom House, New Orleans, La.

Atlanta, Ga.—Bids on the contract for supplying the local water-works department with approximately 18,000 tons of coal ranged from $2.27½ to $2.75 per ton, which is considerably lower than last year's figures. The bids were submitted by eight firms as follows. R. O. Campbell Coal Co.; Brushy Mountain Coal Co.; Tennessee & Southeastern Coal Co.; Sewanee Coal Co.; Randall Bros. Coal Co.; Atlantic Ice & Coal Co.; Continental Coal Co., and the Durham Iron & Coal Co. The samples submitted are now being tested, and contracts will be awarded according to their merits. Address, City Pur. Agt. W. E. Chambers, Atlanta, Ga.